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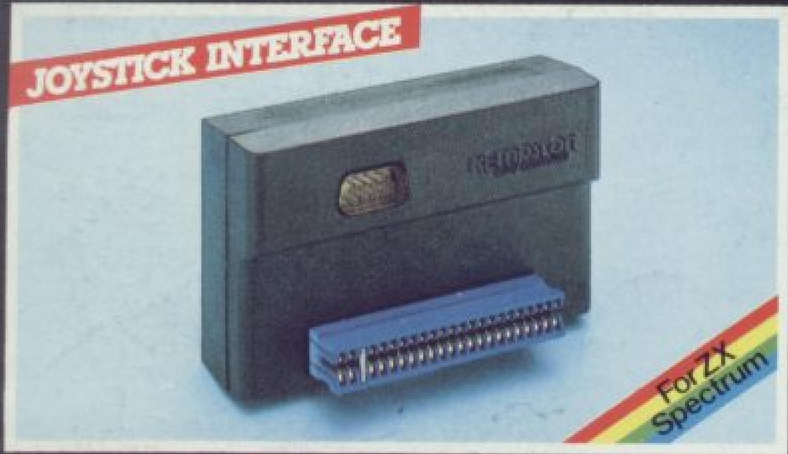
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Compatible with ZX Interface 1 the Pro-Interface has three 9-way D Sockets. Two of the sockets allow compatibility with Sinclair/Psion software whilst the third offers the dual facility of both Kempston joystick software and cursor key software. The Pro-Interface also features a cartridge slot for ROM based software. **ONLY £19.95**



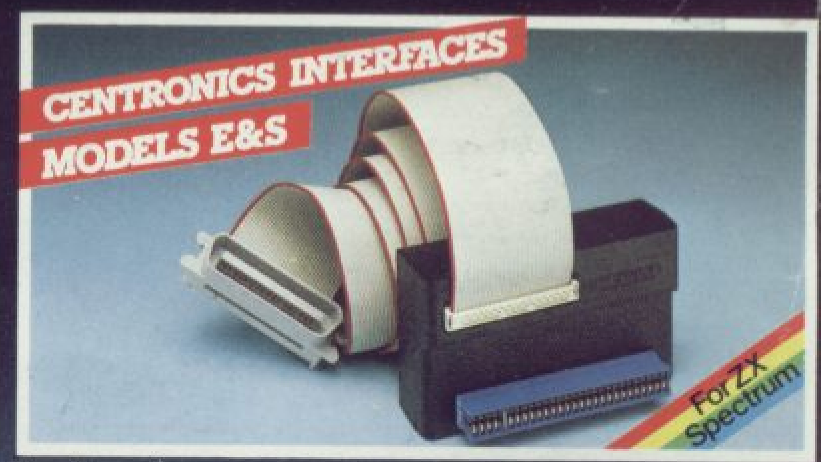
Maximum arcade quality features at a reasonable price. Features: □ Top fire button for one handed thumb control □ Trigger button for one handed index finger control □ Base fire bar for left or right handed control □ 8-way arcade quality leaf switches □ Rubber return action □ 1.5 metre cable. Commodore and Atari compatible. See joystick interface for Spectrum compatibility. **ONLY £12.75**



At last an RS 232 interface for the ZX Spectrum allowing connection to any printer which follows the RS 232 protocol. The interface has its own EPROM allowing the use of keywords LLIST, LPRINT and COPY. We recommend the Brother EP44 Printer for use with this interface.
Interface complete with cable and connector **ONLY £45.00**



The ultimate joystick for the home computer. Features: □ Ergonomic design and nylon covered steel shaft □ 8-way arcade quality leaf switches □ Dual fire buttons for left or right handed play □ Rubber return action for smoothness □ 1.5 metre cable.
Commodore and Atari compatible. See joystick interface for Spectrum compatibility. **ONLY £13.50**



The Kempston centronics interface will allow you to utilise a vast range of printers with an industry standard centronics input port on the ZX Spectrum. **Interface E** has all operating commands held in an EPROM, so plug in and its ready to use. **ONLY £49.99** **Interface S** offering similar features as above but software routines are provided separately to initialise the interface before use. **ONLY £35.00**

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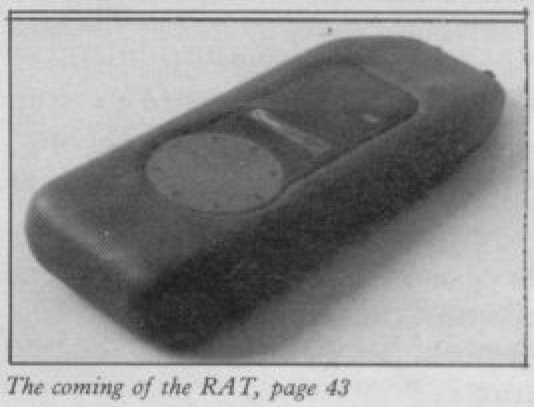
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PLUS

IT SEEMS that almost every day another major chain of high street stores enters the computer market. The latest of these is Marks and Spencer, renowned for its lines of durable Y-fronts and sensible sweaters. The more outlets there are for micro products, the better it is for the user, or so the argument goes. There is, however, dissatisfaction amongst consumers and manufacturers with the service provided by the main street middlemen.

The trade paper *Home Computer Trade Weekly* recently conducted a spot survey of seven retail chains and the signs are not encouraging.

THE TERMINAL SOLUTION

It is no surprise that top of the pops is WH Smith which gets good ratings for floor space, trained staff, software range and layout. It does not, however, score highly where new products are concerned, and that is a fault with all retailers who stock old ranges until they have been cleared off the shelves. Both customer and software house suffers as a result because new products are not generally available. It is not surprising that publishers have complained of disastrous sales this summer when shop shelves are stocked with dusty copies of **Maziacs** and **Mad Martha.**

The amount of shelf space is itself a problem and one which is tied in with floor space given to a computer department. Again WH Smith comes top and Rumbelows comes bottom in the CTW report. In most outlets software is put at the back of the shop where few people can see it and is given little shelf space. Frequently it is displayed inside the forbidding glass cabinets, a discouragement to browsing customers. The display can be confusing, with Spectrum software jumbled up with VIC 20 and Commodore cassettes, under the misleading sign reading 'Atari', or even 'Computer Books'. Cut-price Mastertronic tapes stand shoulder-to-shoulder with full-priced Virgin games, and the price of a particular item can vary on different shelves in the same shop.



Finding software and getting technical help is frustrating for the potential customer. Few chain stores train staff to handle computer buffs and some staff are transferred from other departments to work with computers without having the slightest idea of what a computer can be used for. Those assistants are good at handling merchandise but when it comes to providing information about it they are lost. When in doubt, the answer is "It's out of stock".

WH Smith give the best training of all the computer retail stores and Currys is about to give its staff some help by sending them on courses. Those will take place at Currys training establishment at Worthy Park. The company hopes to turn out computer consultants which it will distribute among 90 of its top computer stores. The consultants should be able to talk about the market, advise which software and machines to buy and how to program.

The identification by Currys of the need for trained consultants in its stores shows that some movement is being made toward market maturity, although chain stores still have a long way to go.

The problems are not only concerned with software distribution and retailing. Readers of *Sinclair User* have experienced difficulty in buying machines and hardware add-ons. One reader had difficulty in obtaining a complete printer package for his Spectrum. He tried Boots, Laskys, Dixons and a back street computer shop before going to a mail order company. That company, Transform, delivered printer, leads and interface on the day that the order was confirmed. If shops are going to carry printers or computers who not stock the necesssary interfaces between the two?

Discs and printer ribbons are notoriously difficult to obtain off the shelf even from the same shops that supply the disc units or printers. One *Sinclair User* staff member bought a printer at Dixons and was told, "Sorry, we don't have any spare ribbons for that printer". WH Smith was no more helpful, Boots had never heard of the printer and Laskys said that one was on order.

A solution to the hardware problem might be elusive but the answer to software availability may be near with the introduction into John Menzies of a system of electronic distribution by a company called Program Express.

Shops using the system each have a computer terminal linked to a mainframe at a computer centre. When a customer wants a particular program the assistant selects the program required. The mainframe can hold 1000 programs at a time and those are updated regularly. The machine downloads the selected program onto disc, tape or ROM cartridge and it can then be taken away.

The retailer would never again have any difficulty in finding or stocking a piece of software. Mind you, the distributors might complain. There would be less need for their services in a world in which software is on tap in the high street.

John Gilbert

First, a question.

Who do you think are the world's most avid consumers of microcomputers?

The ingenious Japanese? The fashionable French? The acquisitive Americans?

Believe it or not, it's we British who own more micros per person than any other nation on earth.

Yet, despite its amazing impact, the microcomputer has only just begun to scratch at the surface of our lives. Without doubt, the best is yet to come.

Use and Abuse.

In several recent surveys, some astonishing facts about micro use and abuse were revealed.

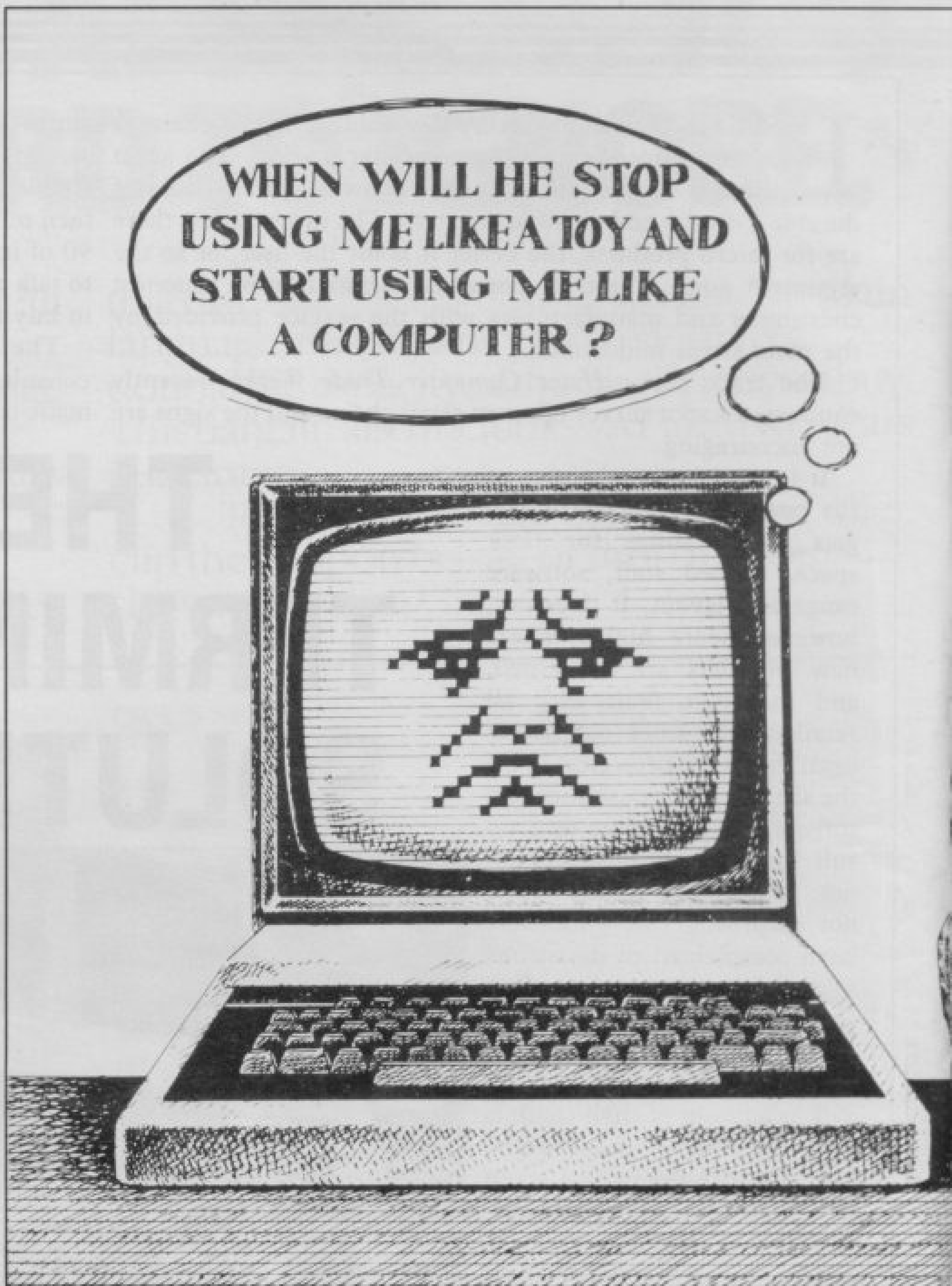
It was discovered that the micro is hopelessly under-utilised. If you're already a micro owner, your own experience may well confirm this unhappy state of affairs.

Brainpower. A source of knowledge.

For thousands of years, the key to self improvement has been in the hands of the written word. Now, thanks to the Brainpower range, it's very much in the hands of the micro.

As the Brainpower range demonstrates, this does not require prior knowledge of micros, or how they work.

The Brainpower concept has been devised as *integrated* applications and educational software. And its aim



Now you and
bring out the b

is to stretch both your mind and your imagination.

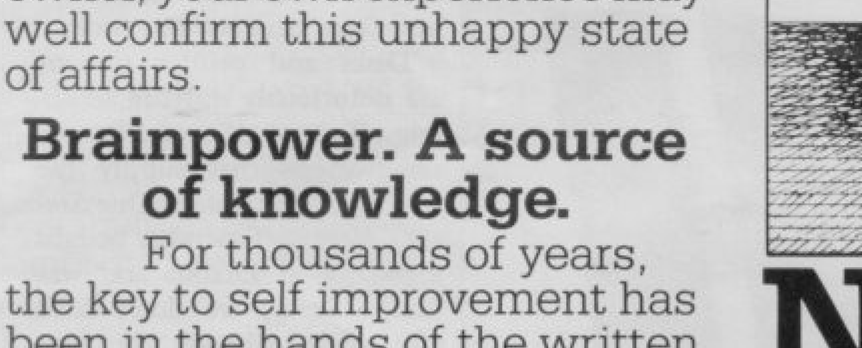
It offers a unique way to realise your own full potential and that of your micro. In a way you could never hope to achieve from the printed word alone.

In this respect, the Brainpower range stands on its own.

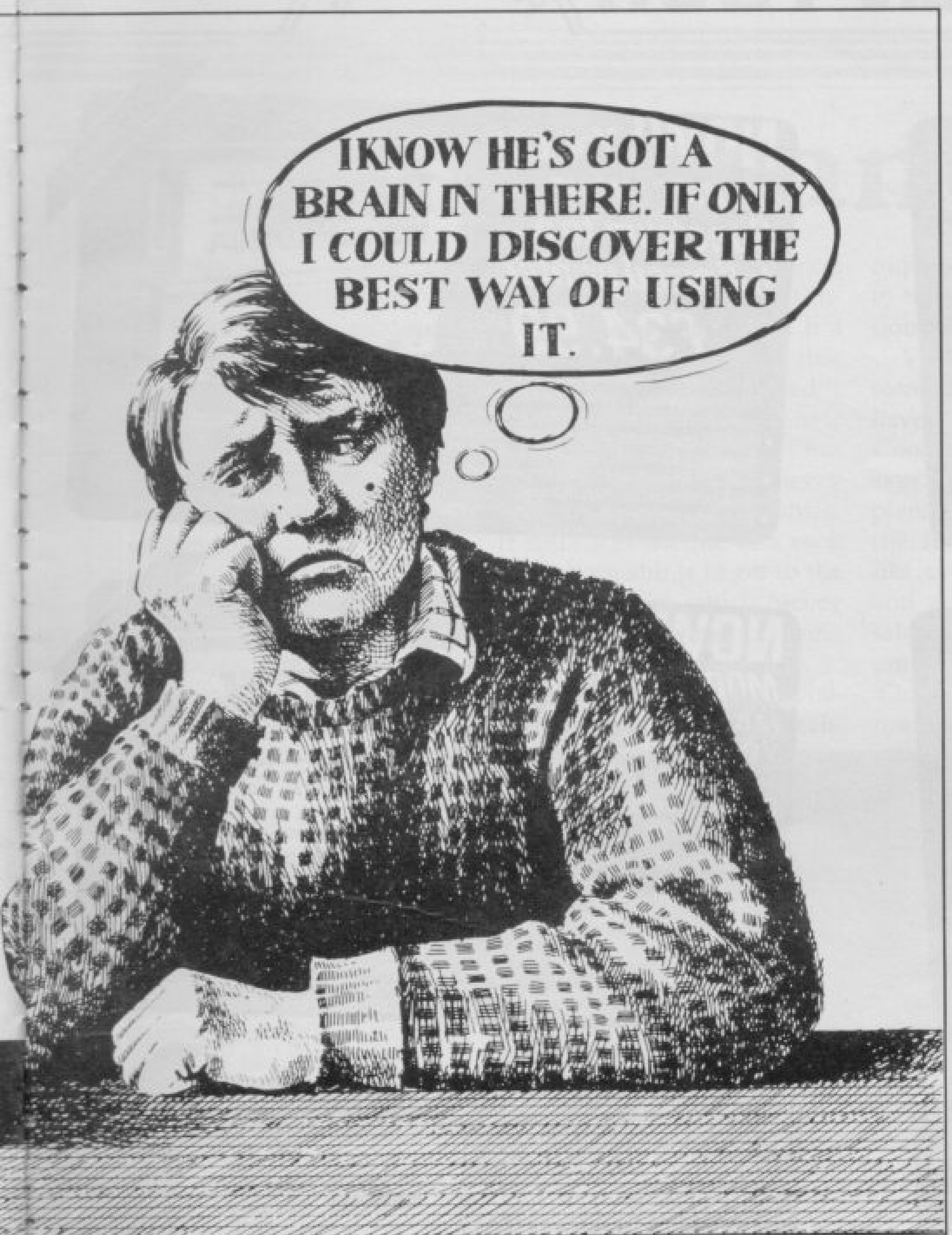
A unique concept.

All the Brainpower titles share one thing in common, apart from their stimulating subject matter, that makes them unique.

You will find each title comprises three distinctive elements: A teaching program that helps you to get to grips



Each Brainpower title provides a unique three part package: an applications program; a teaching program and an illustrated manual and interactive tutorial – integrated applications and educational software



STAR WATCHER

The secrets of the heavens are yours. Isolate all the constellations as well as main stars for easy identification. Even turn stars and constellations on and off at will. Screen by screen, you will see exactly how the 1,500 brightest stars move through time and space. And all from any point on the Earth's surface at any time of the year.

Star Watcher is without doubt the definitive home observatory.

DECISION MAKER



Should you buy a new house? Change jobs? Have children? Start your own business? Such decisions should not be taken lightly. Armed with Decision Maker, you can be quite sure of examining every avenue, and arriving at a rational, structured answer.

If you value the way you run your life, you need Decision Maker.

NUMBERS AT WORK

Tackle all the number problems you're likely to face in daily and business life. From straightforward multiplication and division of fractions, through decimals, percentages, ratios, mark-ups and margins to compound interest, depreciation, VAT and PAYE.

Numbers at Work gives you a distinct edge, since you will be able to both understand and manipulate numbers at will.

PROJECT PLANNER

Project Planner teaches you how to divide even the most complex project down into meaningful components. Learn how to determine the length and importance of every single task, and those elements critical to the fulfilment of your plan. Even anticipate problems you hadn't envisaged.

You have the measure of any situation because you have the fullest possible grasp of all the factors which affect it.

our micro can
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Forecaster takes the guesswork out of forecasting, by accepting that tomorrow's events will be best predicted on the basis of today's facts. Armed with Forecaster, sales targets and growth trends, even sporting events and election results can be accurately and very quickly predicted.

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Invaluable to anyone who is planning a business venture.

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BRAINPOWER

Virgin revamped

MEDIOCRE software has become the hallmark of Virgin Games, but the autumn is going to see a fresh start for the company according to managing director Nick Alexander.

Virgin is going to change its approach to the games market and no longer release a mass of titles for a wide range of machines. Instead it will focus its attention on promoting one or two new titles at a time, concentrating on the Spectrum and the Commodore 64.

Alexander says: "This autumn we are only releasing six titles, all of which have been extensively researched and tested for market appeal and we are going to market the hell out of them".

Two of the six titles are Spectrum games. The first, released in September, is **Strangeloop** and is Virgin's answer to the **Jet Set Willy** cult. It is an arcade adventure game and Virgin is offering a £2,000 robot for the first person to complete it.

Steve Webb, Virgin's Technical Manager, says: "We believe that Strangeloop takes the Spectrum to its limit. We would have called it a Mega Game but we felt that the term has been devalued".

The Biz is the second new Spectrum release and has been written by Chris Sievey of rock group The Freshies. It simulates the life of a rock star whose aim is to get to the top, a vocation which Sievey has been following for some time.

Both games use the specially developed Flashload technique which allows programs to be entered in under a fraction of the normal load time.

Virgin is also dropping some of the titles that they have been marketing. Jeremy Cook, commercial director, says: "We've taken our complete catalogue, thrown out the few duff titles that we, like everyone else, have had, and are putting the rest on sale at a retail price of £2.99 until the end of November. That's a saving of between nearly £3.00 and £5.00".



Virgin Games' prestigious new headquarters

Anti-piracy software

A REVOLUTIONARY remedy to software piracy has been introduced by CSP Systems.

Padloc Nine is a software-based device which can be operated from a Basic program and will protect cassette software for the Spectrum.

The package requires no extra hardware to operate it and is unlike any other system because it acts against copier programs and not hackers who are intent on using their initiative to break into programs.

The system is aimed at any programmer or software house that requires it. The company claims that pirates are unlikely to even detect the operation of the device within a piece of software and that no duplications of a program need be alike.

More information about Padloc Nine can be obtained from CSP Systems, 213 Stainbeck Road, Leeds.

Imagine programmers join Beyond

IMAGINE programmers have been found alive and well and working for Beyond, the company which produced the **Lords of Midnight** adventure game.

The group of six including John Gibson, of **Stonkers** fame, is working on an adventure, called **Shadowstar,** for the company. Simon Goodwins, says: "They approached us as they were looking at the possibilities of staying together as a group".

One of the head programmers working at Imagine who did not join the group when the company went into liquidation was computer whizz kid Eugene Evans. Like the other directors of Imagine, he appears to have gone to ground.

Our readers know best

SINCLAIR USER is the second best selling computer magazine according to the Audit Bureau of Circulation (ABC) figures for the six month period January to July 1984.

The magazine had an audited circulation of more than 96,000 and no other monthly or weekly computer publication has equalled that in the Sinclair market.

As the *Sinclair User* circulation continues to grow, its readership grows even faster. A recent survey of home computer usage showed *Sinclair User* was the best read computer magazine with more than 250,000 readers.

Comrade Clive

SMUGGLING COMPUTERS into Yugoslavia used to be big business because the government frowned upon the import of machines by individuals.

Despite the unofficial ban on microcomputers small groups have been able to smuggle machines into the country. As a result at least 20,000 machines have been smuggled in, two computer magazines have been launched and a game for the Spectrum about computer smuggling, called Contraband, has just been released.

All that is about to change, though, as Sinclair Research has agreed a deal with ISKRA electronics to import Spectrum parts into Yugoslavia where machines will be assembled and marketed.

Asked whether the decision was taken at government level Julian Goldsmith of Sinclair Research says: "Our overseas policy has always been to work with British embassies and consulates so I would think that something like that would be the case".

The Yugoslav Embassy could throw no light on the matter and told us to contact the Yugoslav economic chamber. A spokesperson there says: "There is no ban on the import of computers but an individual who tries to bring a computer into the country may have to pay certain duties. I'm afraid I can't tell you any more as it changes so often".

Damned winners

MORE THAN 2000 entries were received for **The Inferno** competition published in the August issue of *Sinclair User*. The 250 winners, who will each be sent a cassette of the game from Richard Shepherd Software, are listed below:

J Beattie, Aberdeen; Nicholas Court, Bromsgrove, Worcs; S Houghton, Lytham, Lancashire; Katy Muller, Avonside, Leamington Spa; Colin Haughton, Felixstowe, Suffolk; G Moffatt, Sunderland, Tyne & Wear; Ian Thompson, Grays, Essex; Gary Varnham, Bolton, Lancs; Phillipp Ewart, Cheltenham, Glos; J M Lownders, Knaresborough, Yorkshire; C P Webb, Eastwood, Nottingham; Brian Axten, Shepshed, Leicestershire; Lawrence Gilbert, Workingham, Berks; Gavin Mills, Wetherby, W. Yorks; Paul Holden, Rustington, W. Sussex; Steve Ross, Inverness; Mike Mansfield, Hawkhurst, Kent; B Johnson, Pimlico, London; G A Hold, Wakefield, W. Yorkshire; M Wideman, Halifax, W. Yorks; Colin Anson, London, NW2; Ian Clay, Grantham, Lincs; Stephen Pettigrew, Epsom, Surrey; Christopher Haswell, New Barnet, Herts; Nicholas Edwards, Reading, Berks; Niall Fernie, Caithness, Scotland; Richard Costall, Harborough, Leics; J Barnett, Todmorden, Lancs; A E Rochard-Thomas, Purley, Surrey; D C Ward, Chippenham, Wilts; J A Garwood, Colchester; G Davis, London, W14; L Williams, Wrexham, Clwyd; Ashley Ross, Westcliff-on-Sea, Essex; J G Farrell, Sunderland, Tyne & Wear; P Harvey-Hunter, Gosport, Hants; Jonathan Rees, Headington, Oxford; Nigel Knowles, Reading, Berks; Simon Strong, Willesden Green, London; A G Sherriff, Keighley, W. Yorkshire; G Henry, Wirral, Merseyside; Sheila Thomas, Duxford, Cambridge; J D Whitaker, Liversedge, W. Yorkshire; George Gilpin, Stretford, Manchester; Martha Lewis, Derrington, Nr. Stafford; G G Robinson, Edinburgh; Jason Goodwin, Nailsea, Avon; Jonathan Veal, Market Rasen, Lincs; Davis Lumsden, Glenrothes, Fife; Paul Gamble, Dereham, Norfolk; Adam Harvey, Gt. Ormesby, Gt. Yarmouth; Steinar Nohr, Bertnes, Norway; David Cadwallader, Corringham, Essex; Stephen Hardcastle, Hayling Island, Hampshire; Michael Turbett, Co. Tyrone, N. Ireland; Bernie Hamilton, Barnard Castle, Co. 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Playing for time

A WORLD record for the continuous playing of computer games has been claimed by 18-year-old Sean Sullivan of East Yorkshire.

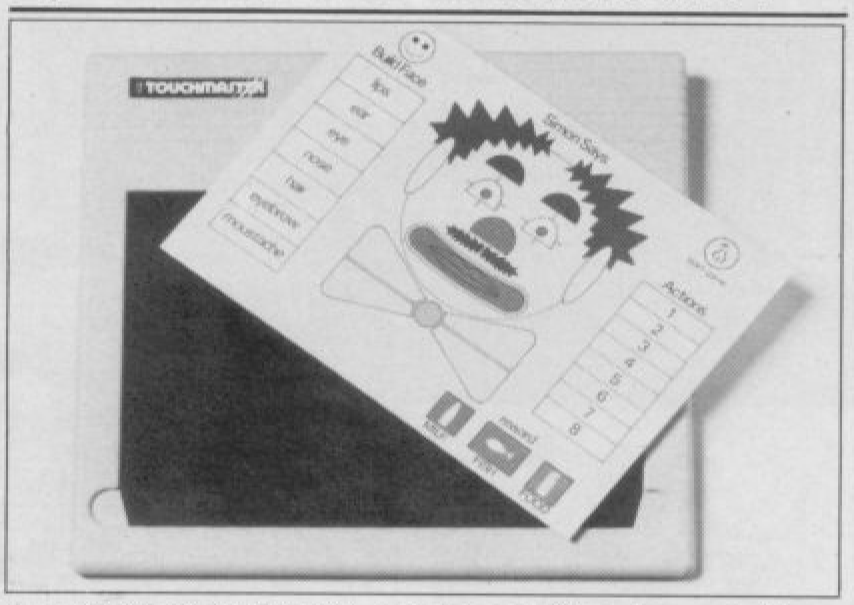
He and his friend Paddy Bell started the attempt at 8 pm on Tuesday 28 August at the Bridlington Computer Centre. Paddy gave up on Wednesday afternoon, after 30 hours, but Sean went through until 10 pm on Thursday 30 August. The record was set at 50 hours and Sean says: "I had set myself this target when I started, yet when I reached it I still felt fresh enough to do a lot more".

Unfortunately, the Guinness Book of Records has refused to have a category for the continuous playing of computer games. The organisers of the event say, however, that it was conducted under the strict standards required by Guinness in the hope that the organisation will relent.

Sean was allowed a five minute break during each hour of the event and two independent invigilators were present at all times. The software was supplied by the Bridlington Computer Centre and the machines used included both the ZX-81 and the Spectrum.

The marathon was sponsored in aid of the Kingfisher Trust, a charity whose aim is to set up a leisure centre for young people in Bridlington, especially those who are unemployed.

Mike Gowen, Chairman of the Trust, says: "We are delighted to be involved in this magnificent effort by Sean and Paddy. Not only will they have raised several hundred pounds for the Trust, but this has given us the opportunity to be involved with young people in something which is of great interest to them, namely computer games. As a result of this Sean and Paddy have already offered their services to help teach young people to program and use computers more effectively, just as soon as we have our centre".



A REVOLUTIONARY touch sensitive keypad from Touchmaster will provide an aid to those who have difficulty using the Sinclair keyboard. The device interfaces with the computer and, with the aid of a series of learning packages together with pad overlays, to be released later this year, will do away with the need for a keyboard.

Fuller is bought out

THE FATE of Fuller Design, the company which produced hardware for the Sinclair computers and alienated many customers as a result, has finally become known. It has been acquired by a company called Nordic Keyboards.

As a result of the move managing director Roy Backhouse and his 12 staff have been made redundant and the company name and tooling taken by Nordic.

Backhouse blames a magazine publisher for paving the way to the ruin of a company which last year had an annual turnover of £500,000. Fuller owed the publisher £3,000 in advertising debts but when the case came to court Fuller Design was wrongly named as Fuller Micro Systems and the claim failed.

Unfortunately, the news of the debt made other companies wary of doing business with Fuller. Backhouse was forced to call a meeting of creditors and later the company was sold.

The new owner has promised to correct the kind of delivery problems which customers had experienced.

Weetabix goes soft

A NEW ARCADE game called **Weetabix versus the Titchies** is to be launched by Romik Software to coincide with a television competition campaign by cereal maker Weetabix.

The game features the characters of the popular television advertisements, runs on the 48K Spectrum and was written by Chris Ratcliffe. Romik says "we're glad to be leading the way into the consumer market".

Computer machismo

FEW PEOPLE may know but 1984 is supposed to be the year of WISE — Women Into Science and Engineering.

According to research done by Ebury Software, however, women are not getting a fair deal in the world of computers. The company report, collated by Audience Selection, shows that males hog the computer at home as well as in the office. In selected families 51 per cent of sons and 25 per cent of fathers used the computer most as opposed to 19 per cent of daughters and only five per cent of mothers.

As a result of the survey Ebury, an imprint of the National Magazine Company, is determined to generate more female interest in computers by publishing software which is specifically aimed at women. These titles will be launched under the name of one of NMC's magazines, *Good Housekeeping*, which the company hope will promote the cause.

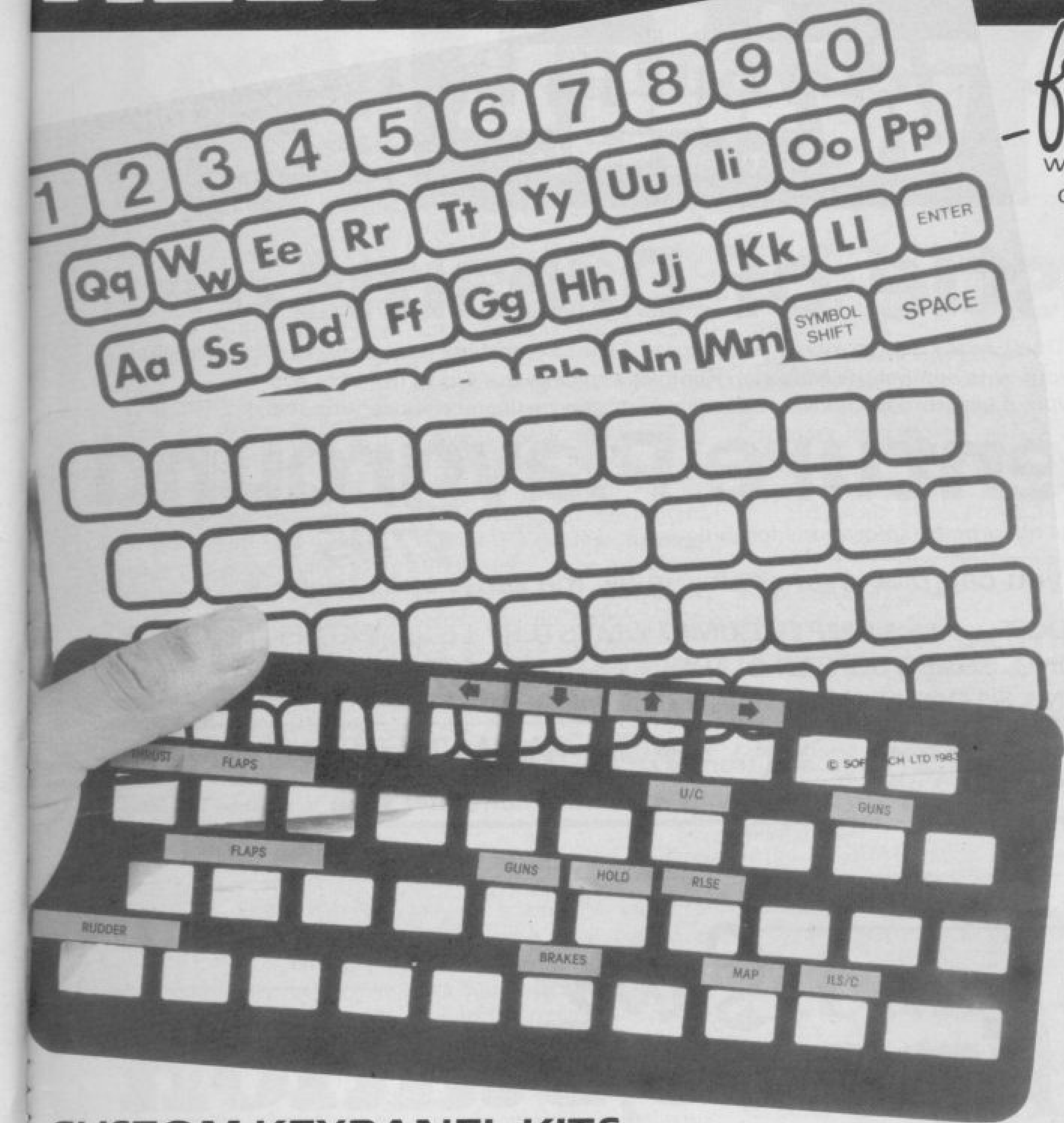
Roger Barrett, Publishing Director of Ebury says: "A woman has just as much ability as a man when learning about computers. In fact, the positive, traditional skills women have, for example, organisation, typing, languages and plain, old commonsense, are all very relevant to computers".

A new book, *Women and Computing,* by Rose Deakin also follows the theme and shows that it is possible to break into the computer world with few qualifications. Deakin explains that some of the greatest programmers in the world were women, such as Ada Lovelace.

More information about the book can be obtained from Papermac, 4 Little Essex Street, London WC2R 3LF.

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Teenage pirates— who is to blame?

THE calculations of software houses are based on the premise that every schoolkid would be willing to buy a tape if they could not obtain a copy.

I would never shell out £15.00 for **Sherlock,** but if someone offered me a copy I would take it, so how could Melbourne House claim to have lost the £15.00 which I wouldn't have paid anyway?

Of the many Spectrum owners I know, all own at least five original tapes, and most have over 30. So stop getting at the kids — who can't afford any more games than they buy already — and try to get the real pirates who churn out hundreds of copies a day, flogging them at cut prices. Software houses and others, give us a break.

Colin Baxter, aged 15, Glasgow.

I WOULD like to comment on Julian Rowland's letter concerning software piracy in the last issue.

It is good to see someone of his age taking a sensible and moral stand on this issue. My school has 10 Spectrums, which are available for games as well as educational use, and I have had to take a very firm line about copying games, to the extent of banning certain boys from the machines.

However, there are two points I would like to make regarding tape copiers. Firstly, most of the boys I found to be copying tapes were doing so using only tape-recorders, notably the dual cassette "ghetto blaster" type. Tape copiers would have been a mystery to most of them, since they were very definitely arcade players rather than would-be programmers.

Secondly, I use a tape copier with no moral scruples at all to transfer programs of all kinds onto microdrive, and I suspect that is their major use. I am quite aware that this may be technically illegal; but if I bought a program, on tape, for my own or school use, and can add the convenience of microdrive, why not? Very few manufacturers seem to be supplying anything on microdrive yet; those who do expect me to pay as much as £8.00 more than for the same program on cassette.

C J Dickinson, St Edmund's Junior School, Canterbury, Kent

I TOO have noticed the huge software piracy which goes on in schools. I know of people who have copied as many as 30 games on one two-hour tape.

I feel a great deal of sympathy for software firms, but surely they could spend more time on protecting their tapes from pirates. Whilst playing **Flight Simulation** I found it was simple to BREAK into the program. **Test Match** by GRL is also extremely easy to BREAK into. Many other games are the same. Surely the software firms have only themselves to blame.

David Betteley, aged 15, Newcastle, Staffordshire.

The world's worst game?

METEOR STORM for the 16K ZX-81 from dk'tronics, is so pathetic I decided to warn people of spending their money on it.

I balanced my cassette holder on the fire button of the computer and manoeuvered my character into the right hand corner of the screen. As I write it is now running.

I believe this game is barely good enough to be a magazine listing, and could be a contender for a record — the only game with a negative Gilbert Factor.

Alistair Macdonald, Sale, Cheshire.

Hacking in the jungle

HAVING JUST hacked my way through **Sabre Wolf,** I have discovered how to obtain infinite lives.

Load the first part of the program press BREAK and stop tape. Type: POKE 23756,1:CLEAR 65535. Edit the line, move the cursor to the end and delete: PRINT USR 23424: Add line 10, with any of the following POKES: POKE 43575,255 — for infinite lives, on player; POKE 45520,255 — infinite lives, two players; POKE 45599,255 — number of initial lives (1 to 255); POKE 41725,255 — no limit on gained lives.

Next add line 20: 20 PRINT USR 23424 and then type RUN to load the rest of the program.

Jeremy Diccox, Dorchester, Dorset.

I HAVE broken into **Cavelon** by Ocean Software and discovered a way of getting any level.

First use all of the crosses, then by pressing every key at once the message "Hi, Chris, what do you want?" appears. Then press any key from 1 to 6 and the game returns to normal. Now the game will start from the level pressed. At the end of level six it plays *Greensleeves.*

Marc Jones, Gotham, Nottingham.

Abandoning the ZX-81

THERE HAS been in your magazine a growing, an annoying trend away from the 'dwindling' ZX-81 market towards the Spectrum and now, to my horror, the QL.

Take the September issue for example. Only four of 56 reviews were for the ZX-81. Most of the Hints & Tips, Helpline and nearly all of the Hardware reviews are for the Spectrum. I give up.

Please don't desert us — there are still a large number of us around. The ZX-81 remains an excellent beginner's computer. Finally here is a tip for the ZX-81 which helps overcome its annoying limited List function.

To avoid the program text scrolling up the screen as it is typed in, delete an early non-existent large line number — about 9000. Upon pressing Return you do not get the last line number at the bottom of a full screen, but a screen with the number at the top and the rest clear. It remains that way after subsequent line numbers are added.

Richard Brooker, Headingley, Leeds.

● *Your criticisms have been noted, and we will endeavour to keep the ZX-81 flag flying. Regarding software and hardware reviews, very little for the ZX-81 is produced nowadays, and while this is a regrettable state of affairs, we can only review what we receive.*

more letters on page 17

Spectrum complaints

YOUR correspondents seem suprised that they have had to return the odd Spectrum or two under guarantee. I had my first Spectrum in May of this year. Three months later, my fifth 48K Spectrum crashes anywhere and everywhere. A replacement, machine number six, will, hopefully, be given me next week. Can anybody beat this infamous record?

Incidentally, Sinclair Research as a company has been singularly unhelpful and unsympathetic on the phone, and unusually rude in answering my letters. What a dance it is leading its founder.

I hope this letter will encourage any other unhappy users to complain — not to Sinclair Research, who couldn't care less — but publicly. I hope that if Sir Clive Sinclair should see this he will apologise on behalf of his company for the unfriendly treatment I have received from his staff and assure me that at least one machine is properly tested before it reaches me.

Terry Braverman,
Cambridge.

DAVID Hetchworth (Letters, September) should consider himself lucky that he couldn't obtain a 16K Spectrum.

In November 1982 I purchased, direct from Sinclair, a 16K Spectrum for £125, an issue 2. It performed perfectly until June 1983 when the keyboard ceased to function. Taking a note of the serial number I returned the computer to Sinclair's marketing agency.

Imagine my disgust when 28 days later I received an issue 1 Spectrum. By that time, the value of the replacement was £99.95, not the 'equivalent value' required by the Sale of Goods Act.

In common with most other people my letters to Sinclair Research have gone unanswered.

The reasons for this cavalier attitude seem quite clear to me; why should an organisation worth many millions of pounds trouble itself with complaints? We the dissatisfied must just sit back and remember Ted Heath's phrase 'The unacceptable face of Capitalism'.

Trevor Jones,
Oldham, Lancashire.

No bugs on moon

FURTHER to John Lambert's review of **Moons of Tantalus** in the September issue, in which he stated that there is a bug in the program, we are writing to assure all your readers that the problem has now been corrected and that all copies of the game are now totally bug free.

We should like to thank *Sinclair User* for its assistance, but would point out that the price of the game is £6.45.

If any of our customers have found that they have a faulty copy of Moons of Tantalus and wish to have it changed, will they please return it to us and we shall be delighted to send them a revised copy, completely free of charge, together with their refunded postage?

Whoops, sorry everyone!

B G Cornhill,
Cornhill Services,
2 Penrith Way,
Aylesbury,
Buckinghamshire,
HP21 7JZ



Disgusted

I AM writing in disgust about Steven Robbie's letter — *Sinclair User*, September — criticizing your reviews of **Halls of the Things** and **Maziacs.**

I have both and I am very pleased with them. Maziacs, far from being monotonous, is exciting and though it's not the hardest Spectrum game ever it is challenging.

All I can say is Steven Robbie has no taste whatsoever.

Andrew Moore,
aged 13,
Liverpool.

I MUST complain at the lack of credibility in your reviews. **Mugsy** does not deserve a Gilbert Factor of eight as it is, leaving aside the graphics, a dull and repetitive game. **Urban Upstart,** on the other hand, is an amusing and reasonably complex adventure deserving at least nine.

Games should be reviewed by the age group which plays them and so I suggest a team of younger reviewers.

Apart from those small points *Sinclair User* is a great magazine easily beating its other rivals.

Sean Buckley,
Hadleigh,
Essex.

AFTER READING various reviews of **Mugsy** and seeing its high placing in the charts I decided to buy it.

I was very disappointed; the graphics are not bad but the game is boring. All you do is type in numbers and the things the characters say are nearly the same every game. There are few scenes.

It is not a patch on **The Hobbit** and how it gets eight points in *Sinclair user* I'll never know.

Chris Boyes,
Wakefield,
W Yorkshire.

Underlining the easy way

IN THE 'Hints & Tips' article (September) there is given a 'memory remaining' routine. For my 48K machine I have used the much simpler ROM routine: PRINT 65536 — USR 7962.

USR 7962 gives the ROM and RAM in use so by subtracting from your total capacity (65536 for 48K) you get the memory remaining. It also allows for microdrive and net channels.

N H Unitt,
Stratford-upon-Avon,
Warwickshire.

Just fancy that

AS AN update to the **Chuckie Egg** affair last mentioned in the September issue, I am pleased to inform you I have reached level 122 with a score of 2,306,560. It took me four hours 30 minutes, then I had to switch it off before my brother or his Spectrum blew up.

Craig Ruxton,
Dalrymple, Ayrshire.

● *You don't think anyone is going to believe that, do you?*

AFTER READING the letters in your September issue I would like to point out that I am the **Sabre Wulf** king. I finished first on June 7.

For proof see *Popular Computing Weekly* Vol 3, No 30. For further proof contact Ultimate.

I finished with a score of 124,405 and 80 percent.

Des Claypole,
The Sabre King,
Peterborough,
Cambridgeshire.

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Are you a club secretary or member of the PTA drowning beneath a deluge of subscription reminder letters and invitations for sponsored walks?

The answer is the new Commodore Plus/4, the computer specially designed for the office at home.

It has the four most commonly used (and useful) software programs actually built into the computer.

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and report writing, a financial analysis program to help you control your budget (Spreadsheet), and a graphics program to translate complex figures into easy-to-understand graphs.

Once your study is spick and span, then you can take advantage of the Plus/4's other features.

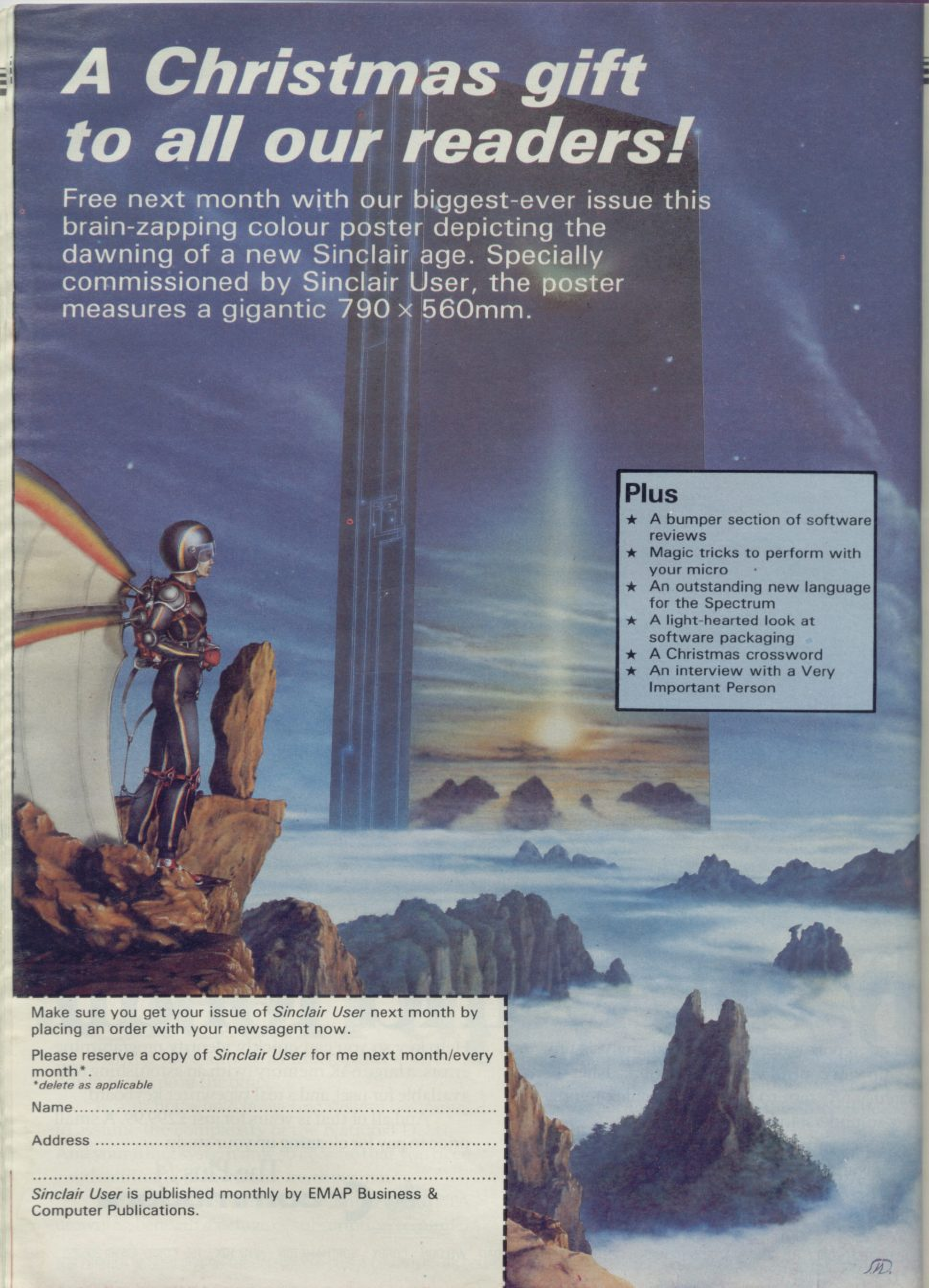
These include the use of advanced BASIC (a more sophisticated, yet simpler form of BASIC), a unique Help key so you can quickly identify programming errors, a large 64K memory (with an astonishing 60K available for use), and a real typewriter keyboard.

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Meet the guardian of chaos and levitate in 3D Avalon

ENTER the 3D movie world of **Avalon.** You are a wizard intent on the destruction of an evil image who inhabits an underground web of caverns inhabited by goblins, skeletons, wraiths, a guardian of chaos and seven wizards.

You move around the rooms after casting an astral projection spell which will enable you to levitate.

Pursued by the various monsters which dwell in the caves you must accumulate your power by finding spell scrolls. Those enable you to freeze your enemies and summon a servant to help you in your quest for the mage's ectoplasm.

To reach the bowels of the earth you must pass through the gate-house level and find a treasure chest in which the key to the dungeons is hidden.

As you travel through the adventure you will become wise in the ways of magic and earn gradings no doubt given by the magic circle. Those are divided into stages and ranks. A stage describes the physical location at which you have arrived in the game. Those range from Apprentice to Supreme. The ranks denote your skill as a magician, and start at Lore Seeker progressing to the august title of Lord Lord.

The magic system in particular breaks new ground. The spells you have are listed on a scrolling window, and you must use the joystick to select the appropriate spell. Even movement is conducted using a spell, so that physical and magical activities are directly interlinked.

Graphics are not so clear as in the Ultimate arcade/adventures such as **Atic Atac**. However, the 3D representation of each room, with doors that really open, and the attempts at animation of monsters represent a bigger challenge than those earlier games tackled.



Hewson Consultants claims the game will do for computers what the *Jazz Singer* did for movies. A ridiculous suggestion which should not however detract from a product that introduces a new style and sophistication in 3D graphics. If you are into arcade games then you will enjoy moving around and killing the monsters in the maze. If, on the other hand, you like adventures you will be fascinated by the puzzles. *John Gilbert*

AVALON
Memory **48K**
Price: **£7.95**
Joystick: **Kempston, Sinclair, Cursor**
Gilbert Factor: **9**

Awkward orcs

SMOKE drifts over the devastated countryside as you set forth in search of the subterranean dens of the Death Moon Orcs. Not long ago a raiding band led by Thorg, chieftain of the unwholesome clan, laid waste your village and murdered your defenceless family. Revenge is all you seek and you will brave the perils of the Savage Lands around the Azonti river to find the bestial killers.

A magic runesword, kept by a hermit, will finish off the ghastly Thorg if you can trace it. Along your way are strewn the marks of war and death, and objects are scattered about which may help you in your single-minded quest. Magic and danger dog your every footstep.

The central theme of **Orc Slayer** by Gamma Software is relatively simple but the setting is well drawn and consistent, providing a good atmosphere for this pure text adventure. The program uses all the standard adventure commands, though the vocabulary did not appear exceptionally large. The interpreter had that irritating habit of responding to many requests with a simple 'I can't' and, at points, rejected the only appropriate responses to a given situation.

In general the program is an entertaining and eventful game full of mystery and monsters. The statutory maze is thrown in for good measure. A good average adventure in the classic mould. Slay away.

Richard Price

ORC SLAYER
Memory: **48K**
Price: **£5.50**
Gilbert Factor: **5**

Awful hawks

GAMES which have television series tie-ups are becoming popular and can be surprisingly good considering it is usually the plot and not the standard of programming that is the important aspect of the game. **Terrahawks,** from CRL is just surprising.

It uses none of the characters from Gerry Anderson's series and the graphics, which should have been the best part of the game, are slightly out of perspective and jump when a move is made in any direction.

The minimal plot takes your spacecraft into a black hole where you will find green crystal towers which you must avoid or destroy. If you destroy them you use one of your 80 antimatter bolts but if you do not then some quick action is required to avoid a crash.

Terrahawks is just another piece of mediocre space entertainment but if your idea of a good space game is blasting your way through a platoon of green monoliths then this game is for you.

John Gilbert

TERRAHAWKS
Memory: **48K**
Price: **£6.95**
Joystick: **Cursor, Kempston, Interface One**
Gilbert Factor: **5**

Astronomy adventure

ASTRONOMER by CP Software is a comprehensive package to display the planets, stars and constellations and calculate their positions reasonably accurately.

The program contains a series of facilities. You may choose to display the solar system, which will move according to a specified time lapse, or the night sky in general, which is split into five views. Constellations will be drawn in if you wish.

The Star Chart enables you to look at any part of the sky in greater detail, while the calculator gives the positions of planets and minor bodies in Right Ascension and Declination.

The accompanying booklet explains some of the principles behind Astronomy, and gives examples of how the program can be used.

As a means of learning the positions of astronomical features and as a guide to where you will actually find them in the sky, the program should prove effective. *Chris Bourne*

ASTRONOMER
Memory: **48K**
Price: **£9.95**
Gilbert Factor: **7**

Daley takes the gold

OCEAN continues its policy of bringing out amusement arcade games under license with a superb version of the popular Track and Field, entitled **Daley Thompson's Decathlon.** All ten events are represented, and played with dedication the full game is a gruelling exercise indeed.

The graphics are large and colourful. Each event has a qualifying time, and the 10 are split over two days, one on each side of the cassette. If you fail to qualify three times then you are out for the day. If you successfully complete the first day, you can go round again with higher qualifying times until your three lives are gone.

Some of the events are very tough, particularly the 400m sprint. In order to qualify you must pump the joystick backwards and forwards as fast as you can to maintain speed. After about 200m the wall of pain sets in. By a cruel trick, the 400m is the last event of the first day and the 100m is the first, so if you are still in the game you will immediately have to race the 100m just when your arm is ready to drop off.

The second day is more gentle, winding up with the 1500m which requires strategy and restraint if you are not to run out of energy too soon. All the events are reasonably easy to play, apart from the high jump, which appears next to impossible. Getting a decent score is, of course, another matter.

Arcade conversions do not always work on the small screen. Daley Thompson's Decathlon is an exception, and captures the spirit of the competition. *Chris Bourne*

DALEY THOMPSON'S DECATHLON
Memory: **48K**
Price: **£6.90**
Joystick: **Kempston, Sinclair**
Gilbert Factor: **8**

Fairy tales and factories in Glasgow

LIFE in a Glaswegian warehouse is evidently dangerous to judge from **Bewarehouse.** Glasgow-based Positive Image has created a game in which death goes hand in hand with the boredom of manual labour.

You must climb up through the various floors of the warehouse, avoiding barrels which roll along the floor. At later levels the warehouse acquires a few ghosts which chase you with murderous intent.

Unfortunately the game is a lame version of **Donkey Kong** with no gorilla, no maiden to rescue, no variety in the levels and very little in the way of addictive excitement. The cassette insert describes programmer Tom Canavan as one of Scotland's finest. I shudder to think what the others are like.

Frog Face, a text adventure from the same company, is rather more attractive. The program credits the Quill adventure system, but includes a number of attractive pictures of locations.

You have had your face turned into a frog by the evil Meegan, and must find a magic potion to restore your natural beauty. The game setting is clearly based on the land of fairytales, with whispering flowers, lucky silver spoons, royal castles and the like, although there are darker and more deadly creatures as well.

The only real fault is that it is very easy to be killed in a somewhat arbitrary fashion early on. Death traps are by no means a bad thing in adventures, but there should not be too many of them. That said, Frog Face is a pleasant romp, and since there is an option to play as a man or a woman, may have a wider appeal than the more macho monster-bashing adventures. *Chris Bourne*

BEWAREHOUSE
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **4**

FROG FACE
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **7**

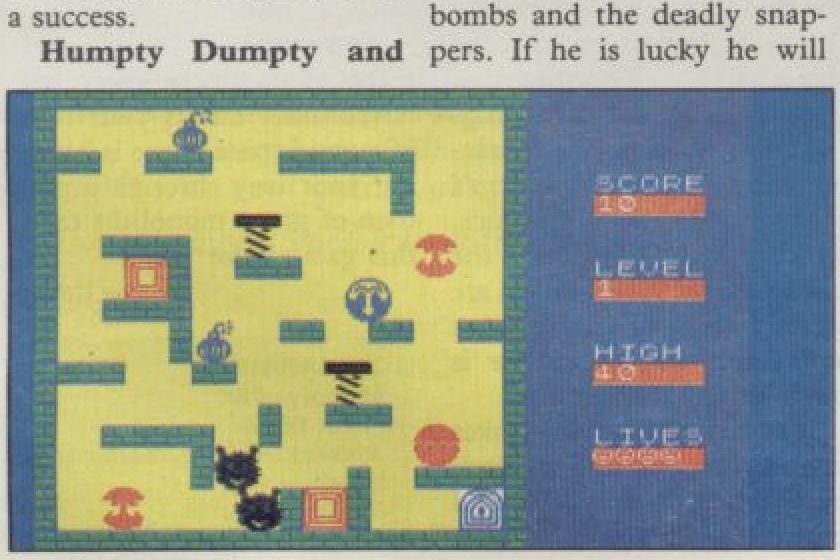
Egg on Humpty's face

ARTIC Computing is heading for a big fall if it thinks that its series of Humpty Dumpty games is going to be a success.

Humpty Dumpty and the Fuzzy Wuzzies is surprisingly addictive. Humpty is struck in a maze. He must avoid the evil Fuzzies, their bombs and the deadly snappers. If he is lucky he will find a transporter to reach safer surroundings.

As any good egg knows the way to get around is to roll and Humpty moves whenever you tilt the maze but be careful as he might end scrambled.

The game has a novel concept but does not develop it. There is nothing either in the scenario or technical execution makes it anything more than mediocre. *John Gilbert*



HUMPTY DUMPTY AND THE FUZZY WUZZIES
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston, Sinclair**
Gilbert Factor: **5**

The great computer fraud

IF YOU have ever had a desire to take part in a giant computer fraud, or longed to break into the Pentagon's central computers, or simply spy on the private accounts of some multi-national company, then **System 15000** is the game for you.

Your friend Mike has written to you with details of a computer fraud in which Comdata has been ripped off by Realco for $1,500,000. Your task is to break into the correct computers in order to transfer the money back to where it belongs. To do so you will need to track down the appropriate accounts and find the correct code numbers to access them.

The entire game is played out as if your Spectrum really was hooked into a vast network of computers. The System 15000 of the title is a high-powered user network similar to Micronet of which you are a member. Mike gives you a few clues to start with, and there is another hacker, Geoff, who may occasionally send helpful messages to you through the system. Otherwise you are on your own.

Whenever you telephone a computer, the Spectrum responds with simulated ringing tones. Sometimes the number is engaged, and sometimes the system shuts down while security checks are made. Somewhere, someone knows you are on the track.

Undoubtedly the economy of a game in which most of the commands are in the form of numbers or character strings of only a few letters, and the display simply a series of different types of computer screen, means the actual structure of the game can be very complex. After playing for many hours, unless you are a master code-breaker or just very lucky,



you will still feel you have only penetrated the outer strands of the web of conspiracy surrounding Realco and the missing millions.

System 15000 is an absolutely first-rate game and the very stuff of which good adventures should be made. We can hardly wait for the sequel.

Chris Bourne

SYSTEM 15000
Memory **48K**
Price: **£9.95**
Gilbert Factor: **9**

Crusoe castaway

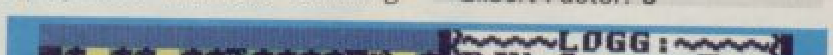
NO prizes for guessing the theme of **Crusoe** from Automata.

A map of the island takes up half the screen, and includes objects which may be useful to Crusoe, who is shown as a small figure. Various status indicators are also shown.

Crusoe's task is to assemble a decent set of living equipment without running into thorns or boulders and reducing his strength. If Automata's eccentric style appeals, you will enjoy the game, though the crabbed script and minute screen detail are likely to irritate even the most persistent.

Richard Price

CRUSOE
Memory: **48K**
Price: **£6**
Gilbert Factor: **5**



Happy driving

A new version of the **Friendly Face** microdrive utility contains several routines, including a piece of code which can be merged into other programs to catalogue and auto-run programs by asking for numeric inputs entered with reference to a menu.

The RUN utility can be automatically saved to any cartridge for use with its programs and does away with the need to type in long microdrive commands which are needed when using Sinclair Basic. RUN can also be batch auto-saved onto several cartridges, one after another, using a program loop within the routine.

The utility has to be adapted for use with some programs but the manufacturer has included ready-made routines to merge Friendly Face into **Masterfile** and **Tasword Two.** That means both programs become instantly microdrive compatible so that data can be SAVEd and LOADed using microdrives.

Two new options include an intelligent FORMAT routine which will make sure that the maximum amount of storage space on a cartridge is made available every time. As with the auto-save facility it can perform its task on a batch of cartridges.

The second new function is a CATalogue of the files on a selected microdrive cartridge which will be listed on a printer. It gives a hard copy of files on a cartridge.

Also included is a Masterfile file which contains two formats. The first, Action, can be used as a database in which you can include a diary of events. These records can be displayed on the screen or printed out for later use.

Memo allows the input of notes and memorandums on a variety of subjects. These can be accessed efficiently using Masterfile.

John Gilbert

FRIENDLY FACE
Memory: **16K**
Price: **Cartridge £12.95**
Cassette £6.95
Gilbert Factor: **7**

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- If you're first to ring it, you save the world and collect the £25,000!
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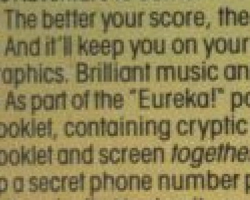
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"Eureka!" was programmed by Andromeda teams led by Hungarians Donát Kiss and András Császár. It took the equivalent of 5 YEARS to create, and the skills of 4 graphic artists, 2 musicians and a professor of logic too. We told them to stretch the hardware's capabilities, and make sure you were kept awake for hours!! They've done it...

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Robots on the rampage

THE ROBOTS have gone loopy in the mechanised factory far out in space. Your job as the metagalactic repair man in **Strangeloop** from Virgin Games, is to get through the rooms filled with dangerous swarf, reach the control room and shut down the crazed computer. On the way you will meet superswarf and an anti-hero who will try to disrupt everything you do, as well as robots which will help you to patch up your space suit when it has been attacked by swarf. Virgin is giving a £2,000 robot to the first player to complete the game.

You are guided by a map on which you can see some of the 240 rooms around you and which will help you find a jet-bike.

You can pick up fuel and patches for your suit and retrieve items such as rings and spanners, which are given out by robots or left strewn around the floor. The objects can be used to perform various tasks which must be done before you stop the factory computer. For those reasons the game can be called an arcade adventure, on a par with **Jet Set Willy** and **Manic Miner.**

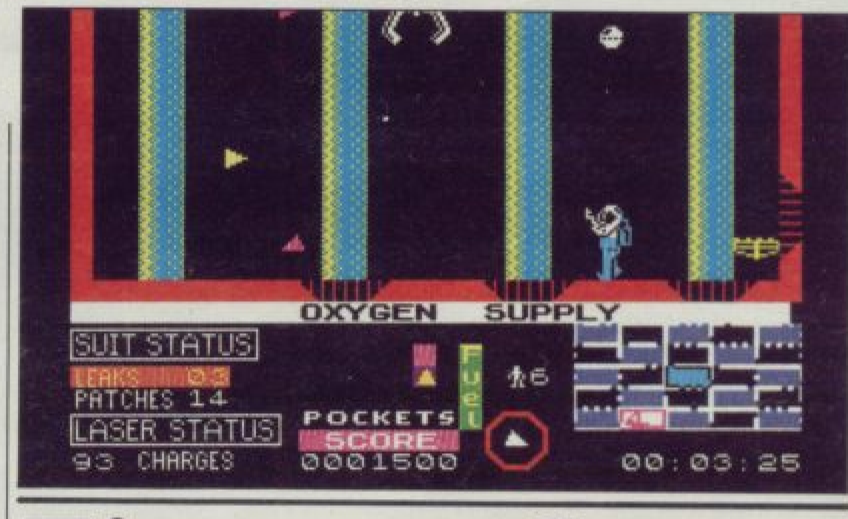
If you run into trouble you can save the state of play onto cassette and resume the game later. You can also halt all the on-screen action to take a quick break. A real-time clock tells you how many months you have spent on the game.

If you are killed off you are reincarnated, as long as you have one of your eight lives left, and may position yourself anywhere within the present room. Thus you can sacrifice a life to escape from a particularly lethal situation.

Strangeloop is more than likely to be one of the biggest selling games at Christmas and may make as large an impact on the market as any game from Software Projects or Ultimate. For the first time in its short life Virgin Games has a winner on its hands.

John Gilbert

STRANGELOOP
Memory: **48K**
Price: **£5.95**
Joystick: **Kempston, Interface 1, Sinclair, Cursor**
Gilbert Factor: **9**



War without Wells

JUST READING the instructions may have you feeling quarrelsome and irritable about **The War of the Worlds** from CRL. H G Wells does not even get a mention and the only way to find out the order of places to visit is to buy the record of the same name.

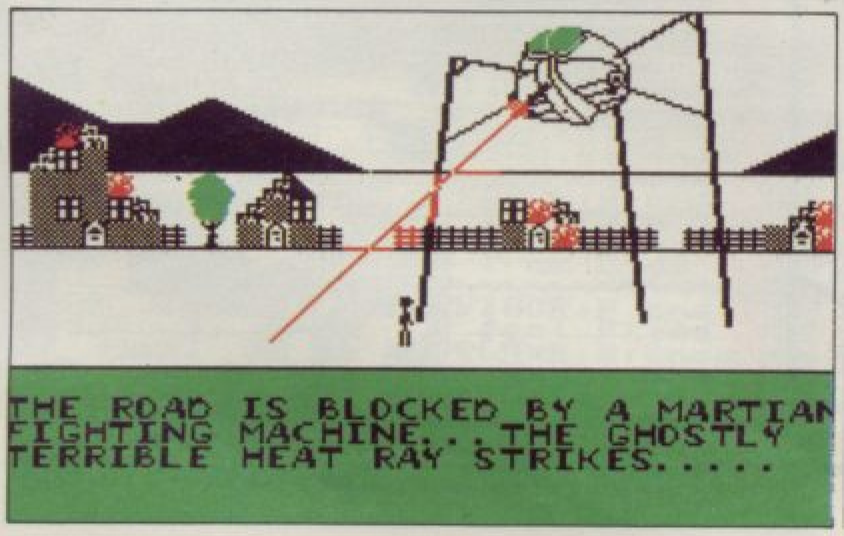
Martian fighting machines terrorize the Home Counties in this graphic 'adventure' and your aim is to guide your man, a stick-like figure, through the moving landscape.

Much of the game seems to be spent moving along the streets towards London and there is no real text input. The few text commands are single key entries such as E for eat or G for get. You will find yourself zapped frequently if you take a wrong turning, which sends you back via long delays to the teletype-style beginning.

After reaching London things get chaotic. I was swamped by refugees from the city for so many moves that I gave up in absolute annoyance as the program seemed to be stuck in an endless loop. No movement was possible after that point.

Richard Price

WAR OF THE WORLDS
Memory: **48K**
Price: **£7.95**
Joystick: **Protek, AGF, Cursor**
Gilbert Factor: **4**



Fireater flops

GOODNESS gracious, great balls of fire! Coming at you every which way too in **Dragonfire** as, in the persona of Prince William, you attempt to cross the drawbridge, enter your castle and rescue the valuables in the Treasury.

The fortress is guarded by a powerful dragon who has clearly dined too well on chicken vindaloo and the fireballs fly thick and fast. Young Willy can be made to jump, duck and run towards the gate and, if he makes it, enters the second screen. That depicts the strongroom where the flatulent reptile lurks.

Willy must then collect items of value and escape once again avoiding incineration. If successful he returns to the drawbridge and begins all over again, only this time the action is faster and yet more dangerous. There are four levels like that, each apparently using the same screens.

The game is fast, challenging, with good strong graphics and clear displays. It is pure arcade and the storyline is minimal. All you need are fast reactions and the urge to play again and again. To begin with the program is exciting and difficult but with only two screens, the thrill soon wears off. That is a serious limitation on what is basically a well-designed game and is bound to reduce its permanent appeal.

Richard Price

DRAGONFIRE
Memory: **48K**
Price: **£6.95**
Joystick: **Cheetah RAT, Kempston, Interface 2.**
Gilbert Factor: **5**

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Quick on the draw

WHITE LIGHTNING is an apt name for the games development package released by Oasis Software.

The package is described by the company as "the first true sprite manipulation language". Although some would not agree with the first point, as the ISP SCOPE arrived on the scene much earlier, it has to be admitted that the package provides a powerful graphics utility language which will add a new dimension to games written by amateur programmers.

Sprites are made up of several character segments which can be moved around the screen in unison. Any one of a possible 255 sprites can be set up at any width and height you indicate. The unit of measurement for sprites is one byte and the most common size is four by four. That will produce characters similar to those which can be found on the Commodore and Atari computers.

The **White Lightning** language is compiler-based and runs Fig-Forth together with a set of commands to handle graphics, sound and input. Oasis has labelled that new sub-set of Forth 'Ideal' and it fills in the holes which the official Forth language leaves on the Spectrum.

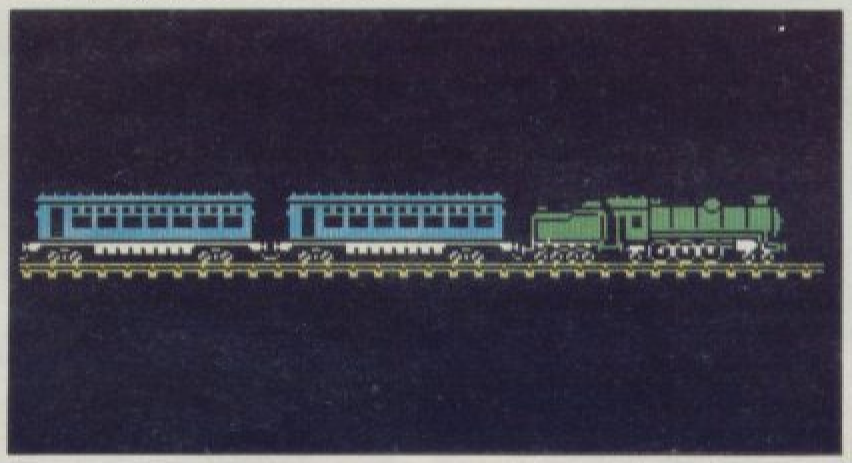
If you do not have any knowledge of that esoteric language then the 131-page booklet which accompanies the package explains all the commands in detail.

As well as being able to use Forth and Ideal you can incorporate Basic commands into programs. The reason for allowing the use of Basic keywords is that a beginner can be gradually weaned onto Forth code and off Basic. That is a commendable idea and one that works well.

Anyone who wants to write compiled games ought to buy White Lightning. It is easily the most complex games language on the market and produces stunning effects on the screen.

John Gilbert

WHITE LIGHTNING
Memory: **48K**
Price: **£14.95**
Gilbert Factor: **9**



Get past the gorilla

ENTER the domain of the two kings who rule **Twin Valley Kingdom.** Explore the forests, the mountain paths and the caverns of the land where eternal life is possible.

You will meet other creatures which may have objects, such as broadswords, which you need. Those monsters are a motley crew and include trolls and gorillas. They have a nasty habit of throwing things at you and do not behave as intelligently as Bug-Byte claims.

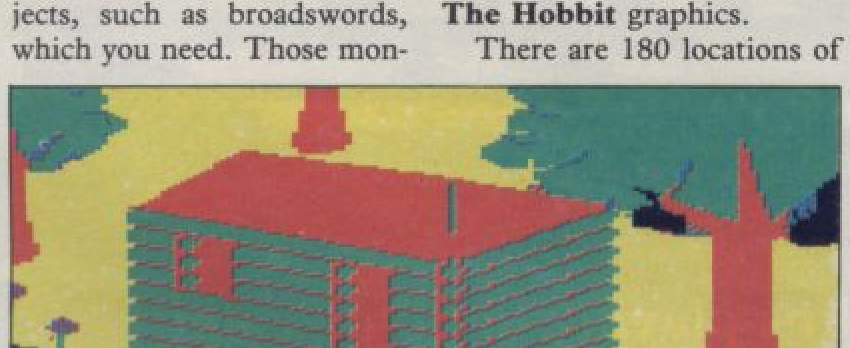
The location pictures are colourful and drawn at a speed which beats that of **The Hobbit** graphics.

There are 180 locations of which 150 have corresponding screen pictures. Bug-Byte claims that it has crammed more locations and pictures into the Spectrum than any other company. That is a matter of opinion.

Another attraction is the addition of speech if you have a Currah Microspeech unit.

The game is excellent value for money. The only criticism is that little seems to happen until you have been playing it for some time and have found some of the objects which you need. That is all part of the simulation and dedicated adventure players should not be put off.

John Gilbert



TWIN VALLEY KINGDOM
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **8**

Young users' picture play

AN EARLY reading program for 3-7 year olds, **Words and Pictures** is based on the old idea of matching pictures to words. Four programs — Wordsa, Sentsa, Wordsb and Sentab — can be called from the menu. On LOADing a list of words appears for each section, and options 1-4 can be chosen; there are approximately 100 words introduced, including prepositions.

You can choose whether to include sound, and a performance table at the end of the game. Both word games operate on the same format; four pictures appear on the screen with a word at the bottom, and the object of the game is to match the word to the correct picture.

The pictures are colourful, although simplified as is the case with computer graphics. That simplification could be confusing if a child is playing the game alone, for the word 'daddy' is supposed to match a picture which could easily be confused with 'man'.

The sentence section makes quite a leap from the initial matching of single words; sentences such as 'The fir tree is always green' are a far cry from the initial matching activity. If the word matching is correct then a frog eats a bug, and when 10 bugs are eaten a song is played. If incorrect the frog leaps up and down.

The booklet provides hints for parents and teachers. Words and Pictures is an adequate first-reading program, but at £9.95 rather expensive. After all, flashcards and word cards could be made for a fraction of the price to provide identical activities, and would probably be a richer visual experience. *Theo Wood*

WORDS AND PICTURES
Memory: **48K**
Price: **£9.95**
Gilbert Factor: **6**

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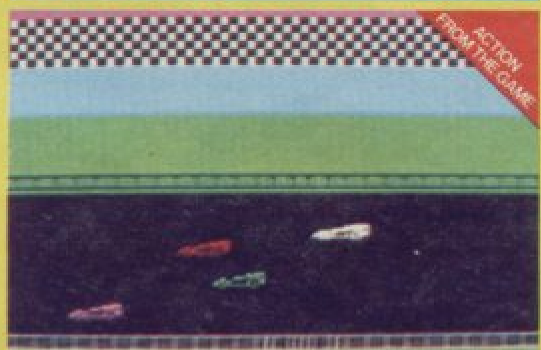


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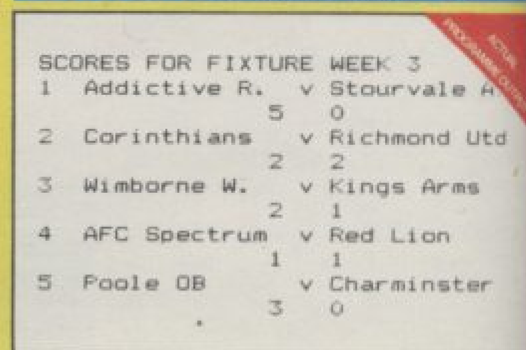
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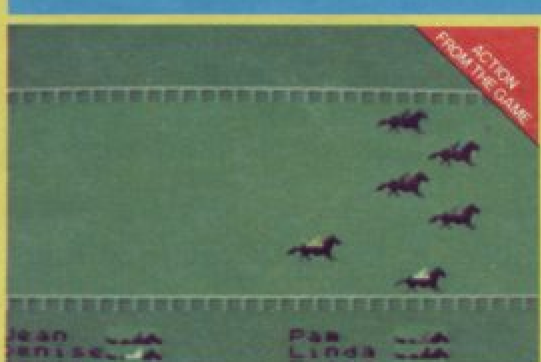


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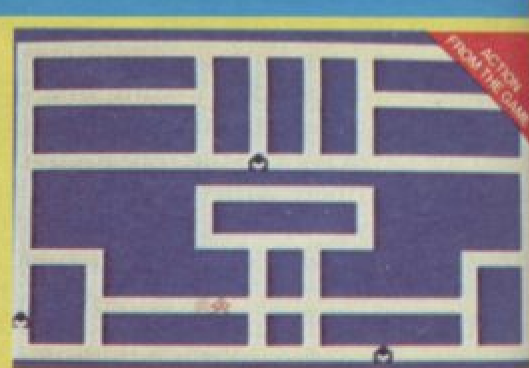
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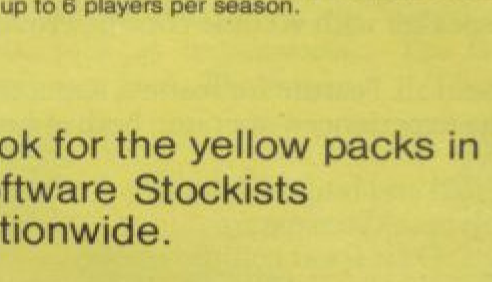
DRACULA'S CASTLE – "This is an amusing arcade game in which you must run around the castle to switch the lights on while avoiding the vampire bats. Beware of sleeping Dracula as lights wake him from his coffin. Can you survive till dawn!"

+



CHAOTIC CAVERNS – "A highly addictive maze chase game with 7 caverns. What really makes this game is that it requires a high degree of strategy to master it."

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Jet-propelled action

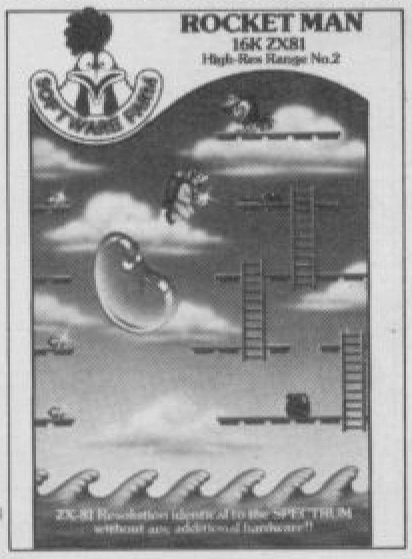
DIAMONDS is where your future lies, diamonds sitting on little platforms above a hostile sea. Why they are there nobody knows, but it is your job to get them.

Unfortunately you are some distance from the diamonds, and have to reach them by using a rocket pack which has no fuel. To obtain the fuel you must leap around a series of platforms and ladders dicing with watery death and avoiding the menacing bubble which pursues you, like something out of *The Prisoner.*

When you have enough fuel you can fly using the rocket pack, but the bubble will still chase you. It is difficult to amass the required quantity of fuel — you must judge for yourself how much you need — but the bubble seems almost unbeatable when you are flying.

At higher levels a touch of the Manic Miners sets in, as your rocket pack becomes a vulture and the fuel legs of lamb. Never mind that the vulture looks more like one of those exotic seabirds which frequently appear performing their mating dances for David Attenborough. Do not ask yourself what ready-carved legs of New Zealand's finest are doing on platforms high above the ocean. Enjoy the game, and avoid awkward questions which might threaten your sanity.

For **Rocket Man,** the second in a series of high-resolution ZX-81 games from Software Farm, is indeed worth playing. For once the high-resolution boast is true, and the game is sufficiently difficult to hold the interest while not being so impossible at the beginning as to discourage you from continuing. The game is not the fastest, but given the apparent intelligence of the deadly bubble, that is probably a blessing. You should be more concerned with working out economical routes and safe tactics for moving round the ladders and platforms than worrying about sheer speed.



Rocket Man is attractively presented and fun to play. While the scenario shows signs of an erratic rather than inspired imagination, at least there is an attempt at inventive whimsy rather than a reliance on the old standbys of laser cannon and dragon breath.

On the strength of Rocket Man, Software Farm is to be congratulated, not least for its loyalty to a machine which few professionally minded software companies are seriously considering. Since the game is the second in a series, and a series would seem to imply more than two games, we hope it will be not long before the next is released.

Rocket Man can be obtained from Software Farm, Freepost (BS 3658)A, Bristol, BS8 2YY. *Chris Bourne*

ROCKET MAN
Memory: **16K**
Price: **£5.95**
Gilbert Factor: **7**

Laser fare

SOME COSMIC disaster has resulted in numbers of spacemen being marooned in the inhospitable wastes of the asteroid belt. It is your task in **Space Rescue** to collect them and ferry them to their home planet.

Of course, life and arcade games are never so simple, and a meteor storm is in full progress at the time, so you must dodge or destroy the deep-space debris while locating the astronauts.

The graphics are impressively drawn, partly in high resolution, and machine-code programming ensures that the action is fast. You pilot a small craft with UFO written upon it, which must leave the mothership in search of the lost astronauts. The playing area is several times the area of the screen, so you will have to search to find the spacemen.

Once found, they must be ferried back to the mothership. Be careful as you dock, or you will crash, and lose a life. Then the scene changes to a region of space populated with space stations, where you must deposit the man, and then return to head out again for the asteroids to make another rescue.

The craft is equipped with a laser gun, which can fire in eight directions. That, coupled with the movement of the craft itself, gives six different commands, and it is a little difficult to control the ship at first on the ZX-81 keyboard. Fortunately, D Pinch has provided a wide range of keys which can be used, and it should be possible to find a configuration to suit your own personal taste.

Although the game is repetitive, it is fun to play and has four levels of skill, so if the easier levels become boring, you can increase the number of meteors in the storm to provide a new challenge.

Space Rescue can be obtained from D Pinch, 72 Norwood Crescent, Coldbrook, Barry, South Glamorgan. *Chris Bourne*

SPACE RESCUE
Memory: **16K**
Price: **£2.99**
Gilbert Factor: **7**

Of mice n'bugs

MICRO-MOUSE goes debugging is the unlikely title of an arcade game in which you are a minature mouse living in the bowels of the computer. The lines of a program are continually under attack from bugs, and it is your job to keep the program free and functioning.

What you see on the screen is a few lines of Basic with some letters flashing. The flashing letters are missing and you must go to one of four bins in the corners of the screen to collect the letters and replace them in the program. The bugs, meanwhile, will carry off more letters, and if the program is sufficiently corrupted the system will crash.

The game is fun to play with a novel, if whimsical, idea. Be careful when you play lest you mistake the 'system crash' in the game for a genuine system crash — the effect looks very realistic and lasts for several seconds.

I always wondered how Sir Clive managed to cram so much into the ZX-81 at the price. Now we know — it was nothing to do with custom-built chips at all, simply exploitation of cheap mouse labour.

Chris Bourne

MICRO MOUSE GOES DE-BUGGING
Memory: **16k**
Price: **£5.95**
Gilbert Factor: **7**

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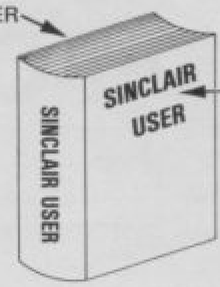
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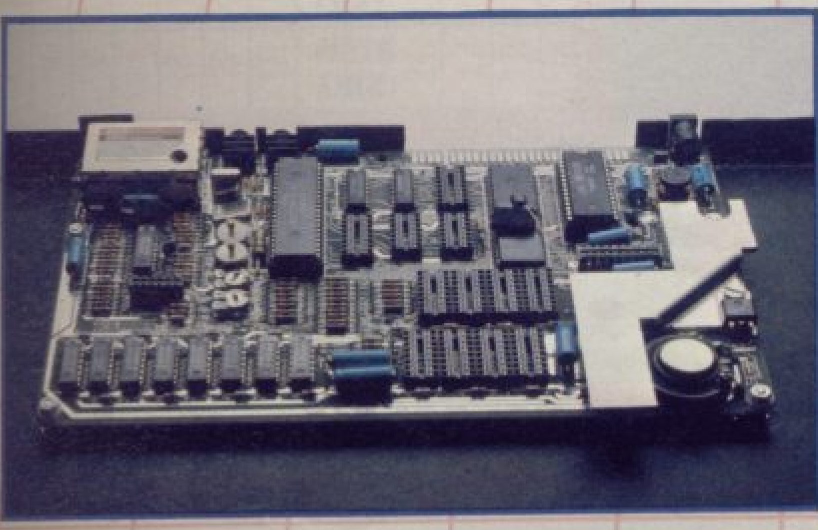
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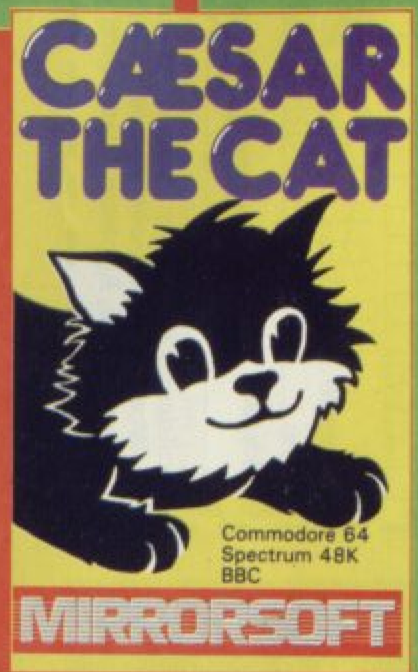
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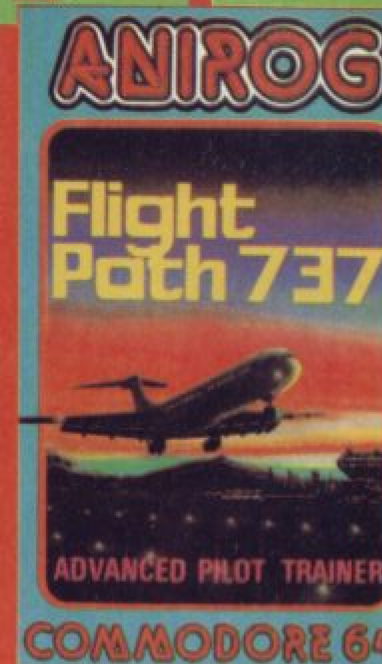
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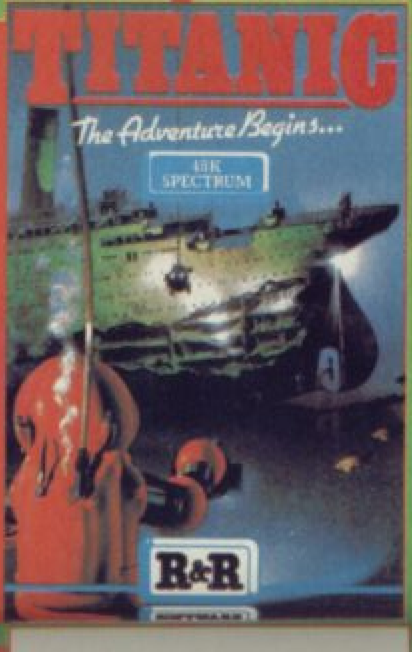
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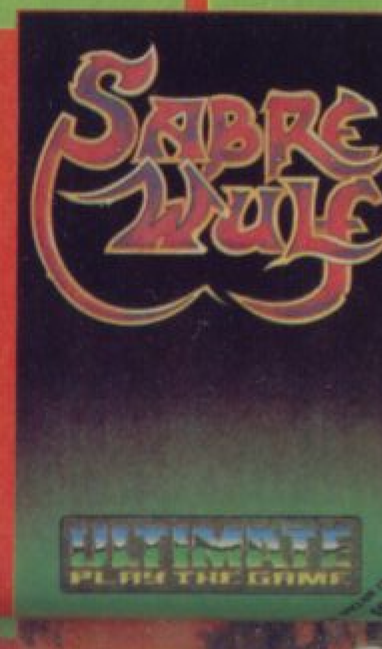
SOFTWARE TOP 30

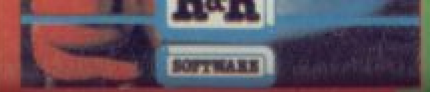


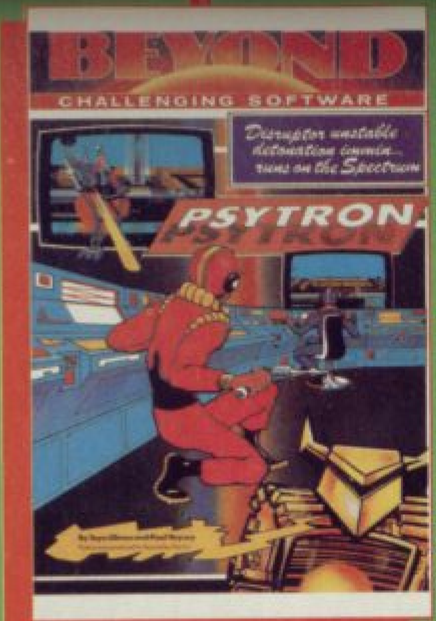


THIS WEEK	LAST WEEK	WEEKS IN CHART	TITLE Publisher	Computer	SPECTRUM	VIC 20	CMMDRE 64	ELECTRON	ATARI	DRAGON	ORIC	BBC	OTHER
					(Available on)								
1	9	2	DALEY THOMPSON'S DECATHLON OCEAN	Commodore 64	●		●						
2	2	5	FULL THROTTLE MICROMEGA	Spectrum	●								
3	–	1	MONTY MOLE GREMLIN GRAPHICS	Spectrum	●		●						
4	4	7	BEACH HEAD ACCESS/U.S. GOLD	Commodore 64			●						
5	5	13	JET SET WILLY SOFTWARE PROJECTS	Spectrum	●								
6	3	3	DECATHLON ACTIVISION	Commodore 64	●		●						
7	11	3	MICRO OLYMPICS DATA BASE/MICRO USER	Spectrum	●		●					●	
11	6	7	LORDS OF MIDNIGHT BEYOND	Spectrum	●								









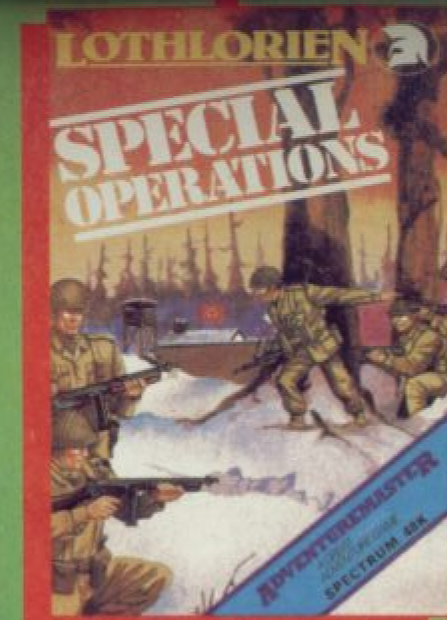


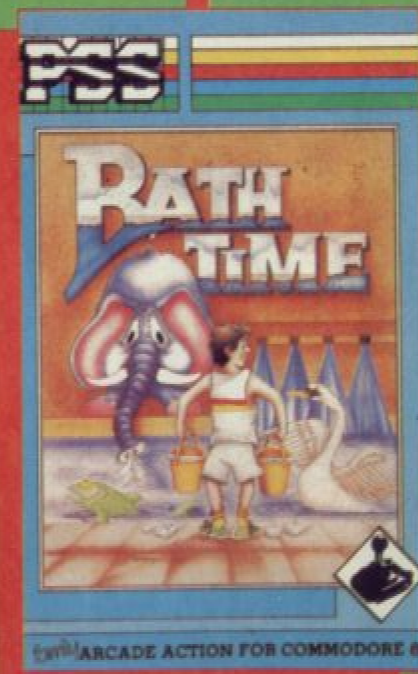
			DECATHLON ACTIVISION	Commodore 64	●		●						
7	11	3	MICRO OLYMPICS DATA BASE/MICRO USER	Spectrum	●		●					●	
8	7	6	TORNADO LOW LEVEL VORTEX	Spectrum	●								
11	6	7	LORDS OF MIDNIGHT BEYOND	Spectrum	●								
12	20	8	JACK & THE BEANSTALK THOR	Spectrum	●								
13	19	8	PSYTRON BEYOND	Spectrum	●								
14	8	4	MATCH POINT PSION	Spectrum	●								
15	—	1	VALHALLA LEGEND	Commodore 64	●		●						
16	22	11	TRASHMAN NEW GENERATION	Spectrum	●		●						
17	23	2	FLIGHT PATH 737 ANIROG	Commodore 64		●	●						
18	17	14	FIGHTER PILOT DIGITAL INTEGRATION	Spectrum	●								
19	—	1	WAR OF THE WORLDS C.R.L.	Spectrum	●								
20	27	3	WORLD CUP FOOTBALL ARTIC	Spectrum	●								
20	—	1	OLYMPICON MITECH	Spectrum	●								
22	28	14	ATIC ATAC ULTIMATE	Spectrum	●								
23	13	12	CODE NAME MAT MICROMEGA	Spectrum	●								●
24	—	1	FRAK AARDVARK	BBC								●	
25	—	1	DALEY THOMPSON'S DECATHLON OCEAN	Spectrum	●		●						
26	—	1	3D MAZE MASTERTRONICS	Vic 20		●							
27	—	1	FLIGHT PATH 737 ANIROG	Vic 20			●						
28	—	1	GNASHER MASTERTRONICS	Spectrum	●								
29	—	1	SON OF BLAGGER ALLIGATA	Commodore 64			●					●	
30	30	2	BLAGGER ALLIGATA	Commodore 64			●	●				●	●



Look out for the brand new 'Top 10' in the Saturday edition of the DAILY MIRROR, every fortnight.
Plus the complete 'Top 30' in Computer & Video Games at your newsagent on the 16th of every month.
Information compiled by N.O.P. Market Research Ltd.

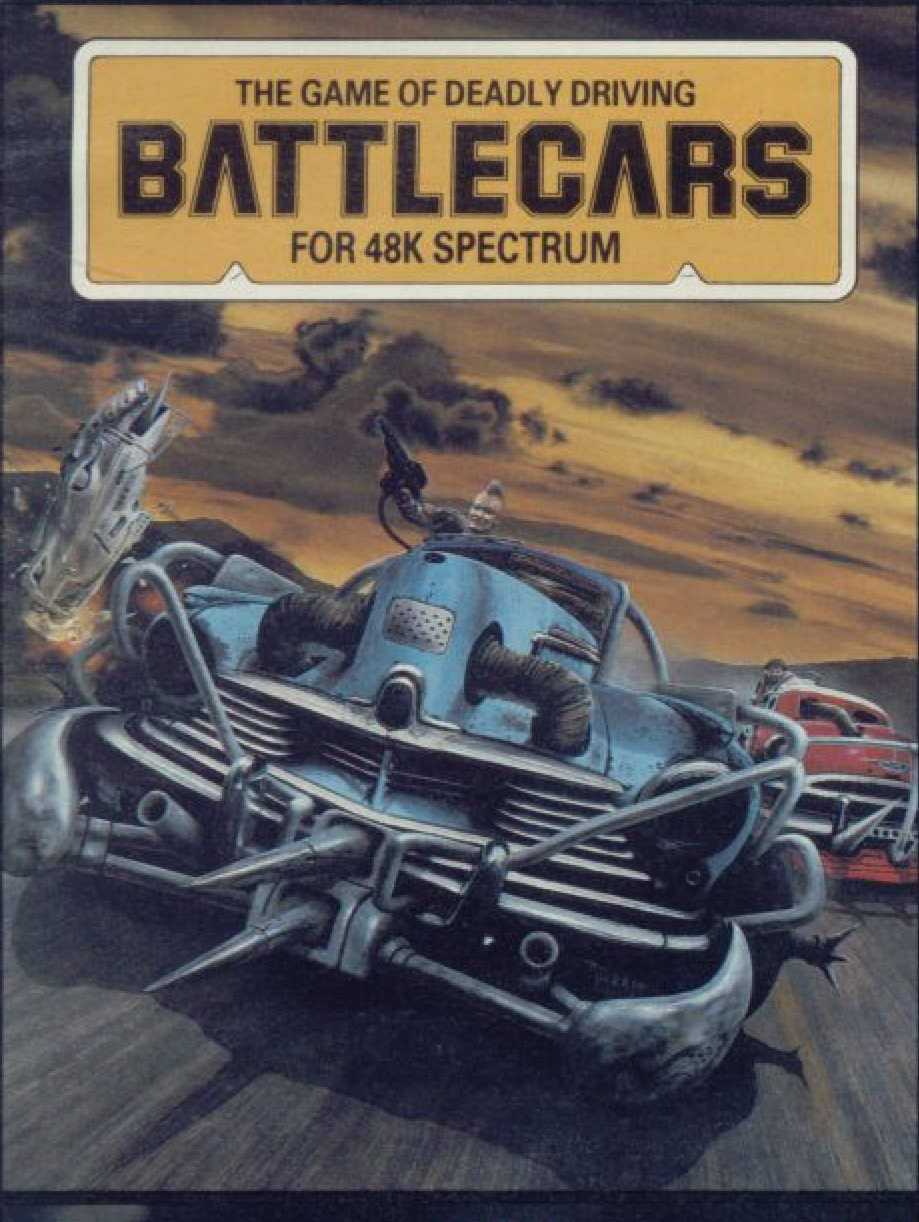


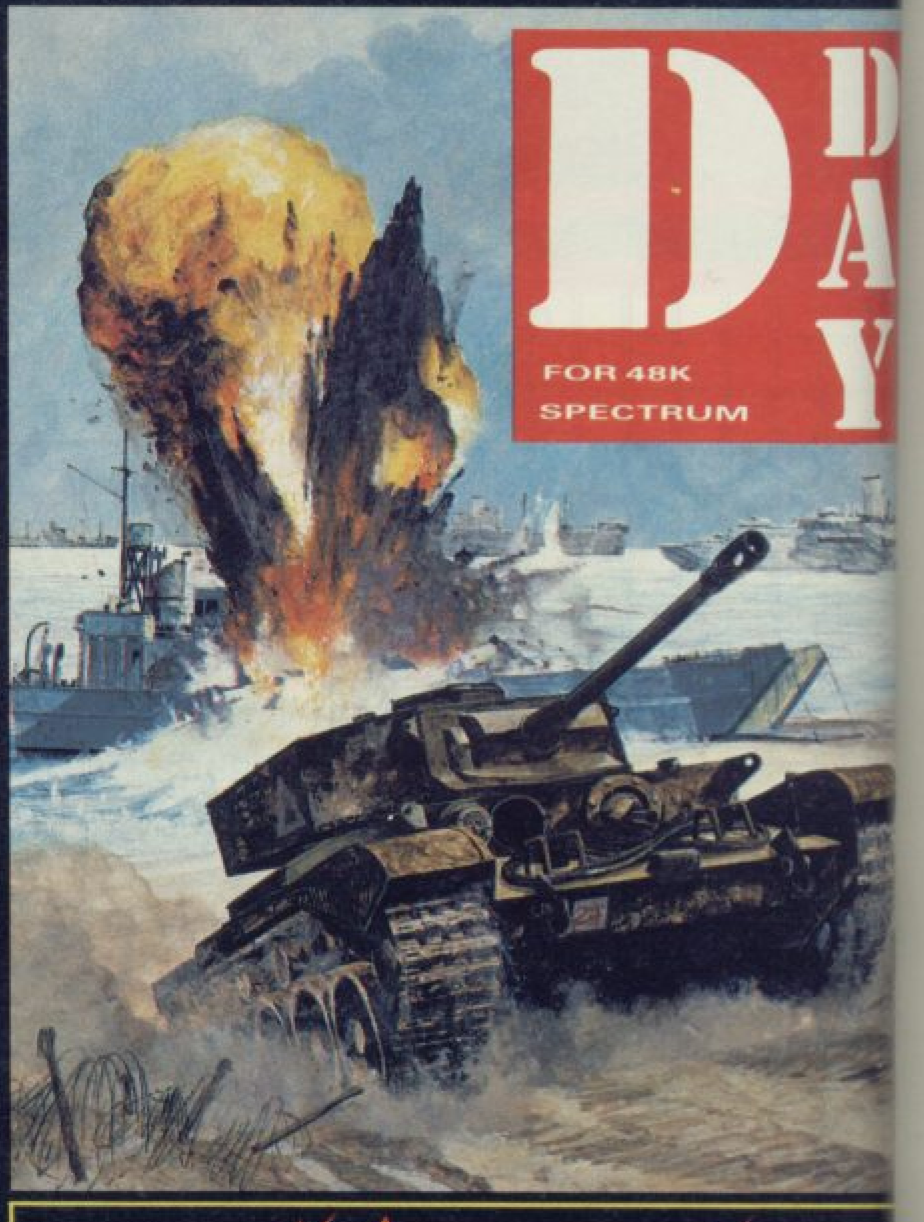


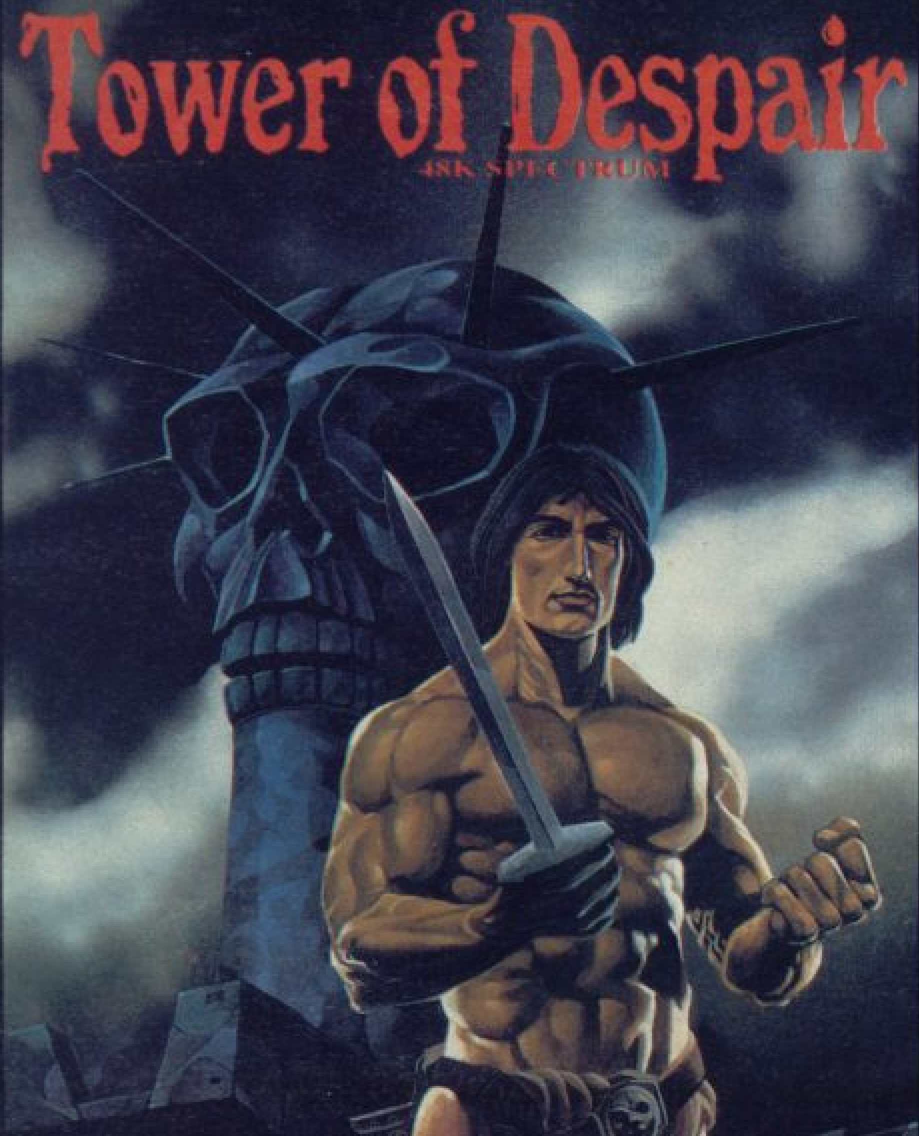




The New Force in Softwar







GAMES WORKSHOP

GAMES WORKSHOP is the UK's largest fantasy and adventure games co
pany, with ten years experience behind it. Now we're using our expertise
create the best in computer games, and the first three are BATTLECAR
D-DAY, and TOWER OF DESPAIR - each with over 90K of programming!

BATTLECARS is the deadly sport of the future...arm your battlecar w your chosen weapons, a select your battleground: gruelling speed circuit or town centre labyrin BATTLECARS is a one or tw player game of skill, nerve a cunning.



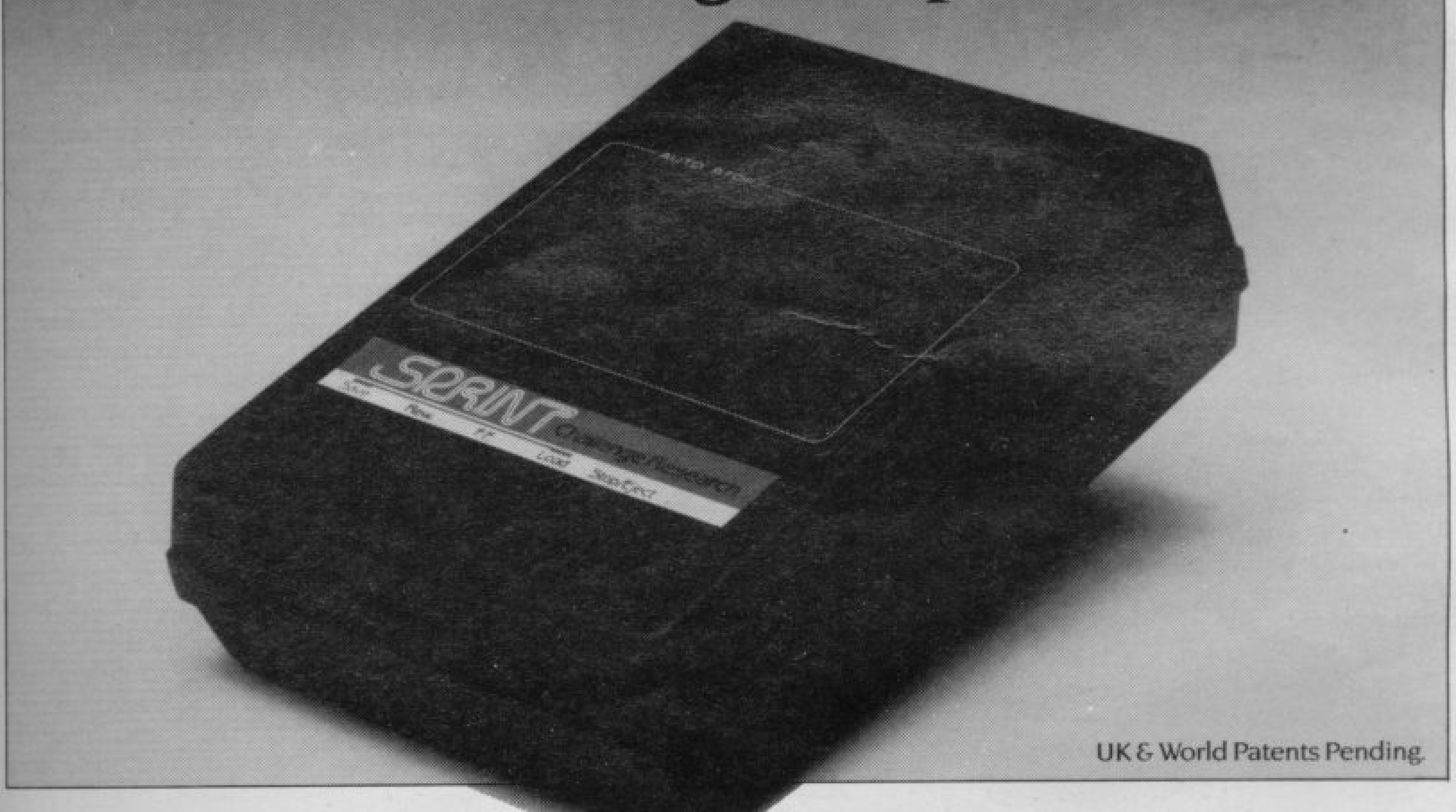
D-DAY is a superb grap wargame based on the N mandy landings of 1944. T players take the Allied a German sides, battling through four seperate scenarios. D-DAY offers enduring tactical challenge to players tired of simple arcade action.

In TOWER OF DESPAIR, Games Workshop has used its ten years of expe ence in role-playing games to create an outstanding adventure. It includ two entire 48K programs, and a guide containing a history, map, and illu trated clues.

FOR 48K SPECTRUM AND SHORTLY FOR THE COMMODORE 6

£7.95 EACH FROM ALL GOOD SHOPS OR DIRECT FROM:
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Introducing the Sprint



It loads Spectrums four times faster than an ordinary cassette player, uses standard cassette software, and has improved loading reliability.

All for just £64.95.

The new Sprint from Challenge Research will load and save Spectrum programs at four times the speed of conventional cassette players, this even applies to standard program and games cassette software that has been pre-recorded at normal speed. All this plus improved loading reliability is available for just £64.95 inclusive of post, packing, VAT and a 12 month guarantee. The Sprint is dedicated to both the 16K and 48K Spectrum and provides an innovative but inexpensive new concept in cassette tape storage.

Use of the Sprint is simplicity itself:

- Retains the standard Spectrum commands and format.
- Advanced digital circuitry and signal processing improves loading reliability and eliminates volume setting.
- Simply plugs into the Spectrum port – no interface or external power unit is required, it even has it's own expansion slot so that you can still use other peripherals at the same time.
- A full 48K program will load or save in 75 seconds rather than five minutes with a conventional cassette recorder.

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Wafadrive v microdrive



THE ROTRONICS Wafadrive is likely to be the main competition to the Sinclair Interface One and microdrives.

The unit is more compact and better designed than Sinclair's, containing both RS-232 and Centronics printer interfaces as standard.

The power for the drives is taken from the Spectrum user port and fed through a ribbon connector which is fitted onto the base of the Wafadrive. That connection could be a disadvantage as it limits the range of other peripherals that can be put onto the user port at the rear of the drive unit.

The large manual supplied with the drive shows that the storage medium contained within the cartridges can have 16K, 64K or 123K formatted capacity, approximately 40K more than a ZX Microdrive.

Before use a tape cartridge has to be FORMATted. Once that has been done the drive will display drive name, wafer name, list of files, type of code, size of each file and how much space is left on the wafer.

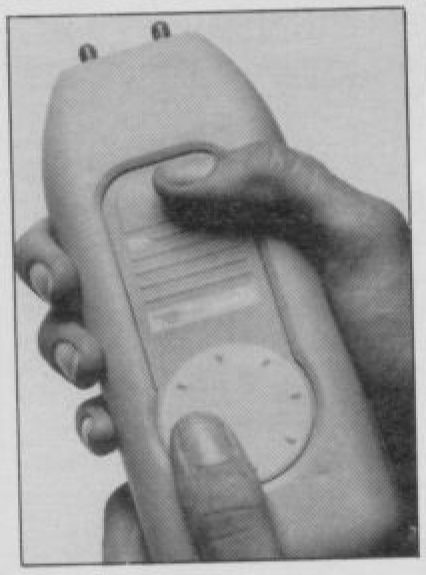
Once SAVEd, programs are easily LOADed . The drive is slower than a microdrive but faster than cassette. It is also more reliable than the Sinclair storage unit and all Basic programs run after LOADing from it ran first time.

Backing up programs is easy with the Rotronics unit. Code can be copied from drive A to drive B using the system software supplied by the manufacturer. Cartridges are, however, guaranteed for a lifetime of 5000 hours and, at a cost of £3.99 each, they represent better value than the Sinclair cartridges.

One small criticism of the drives concerns the printer interfaces which use push-on connectors. It is possible that they might wear quickly if maltreated and that normal plugs might have been better. The Wafadrive is sold with two manuals, two free wafers, a word processor package together with an extra manual describing its use.

It costs £129.00 and can be obtained from Rotronics Ltd, Santosh House, Marlborough Trading Estate, West Wycombe Road, High Wycombe, Bucks, HP11 2LB.

The RAT sees red



Conventional joysticks are dead! claims Cheetah Marketing, unleashing the RAT upon an unsuspecting public. The RAT — Remote Action Transmitter — is a joystick with a difference, remote controlled, working up to 15 feet from the receiver unit.

The receiver unit has a user port connector and a rear edge connector for other add-ons. The unit picks up infra-red beams from the hand set, which is touch sensitive and similar to TV remote control. The handset has two touch pads which work in a similar manner to the ZX-81 keyboard. In the base is a compartment which takes a PP3 battery. The RAT is operated by pointing its nose at the screen and pressing its pads.

The RAT was tried on several games, and was found to be hard on the hands because of the pressure needed to push the pads.

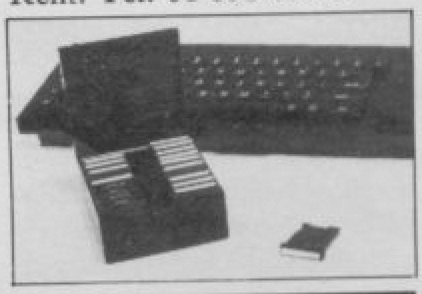
When used on TVs with a remote control facility the RAT changed channels constantly without controlling the objects on the screen. Cheetah assures us that this bug has now been eliminated. On other TVs and monitors the RAT worked well.

Retailing at £29.95, the RAT can be run to ground in High Street chain stores and computer shops.

Keeping track of your microdrive cartridges

STORING microdrive cartridges has, up to now, been a problem but the new Cartridge Box from Transform should solve it. Made to match the Spectrum and QL, the flip top box will house 20 cartridges and has space to hold record cards in the middle. Any number of boxes can be slotted together.

Priced at £5.95 the boxes are available from Transform Ltd, 41 Keats House, Porchester Mead, Beckenham, Kent. Tel: 01-658 6350.



Resetting without tears

FROM Computer World comes a reset switch for the Spectrum which does not involve opening up your computer, and thus does not invalidate the guarantee.

The switch avoids constantly removing the power lead when resetting the Spectrum, although putting the switch on top of the case would have been better, as you must hold the case each time the switch is pushed. Instead there is a light emitting diode (LED) on the top to tell you the power is on.

The main reason for having this type of outside reset switch is to save your power socket and plug from all the wear and tear it would receive in normal use.

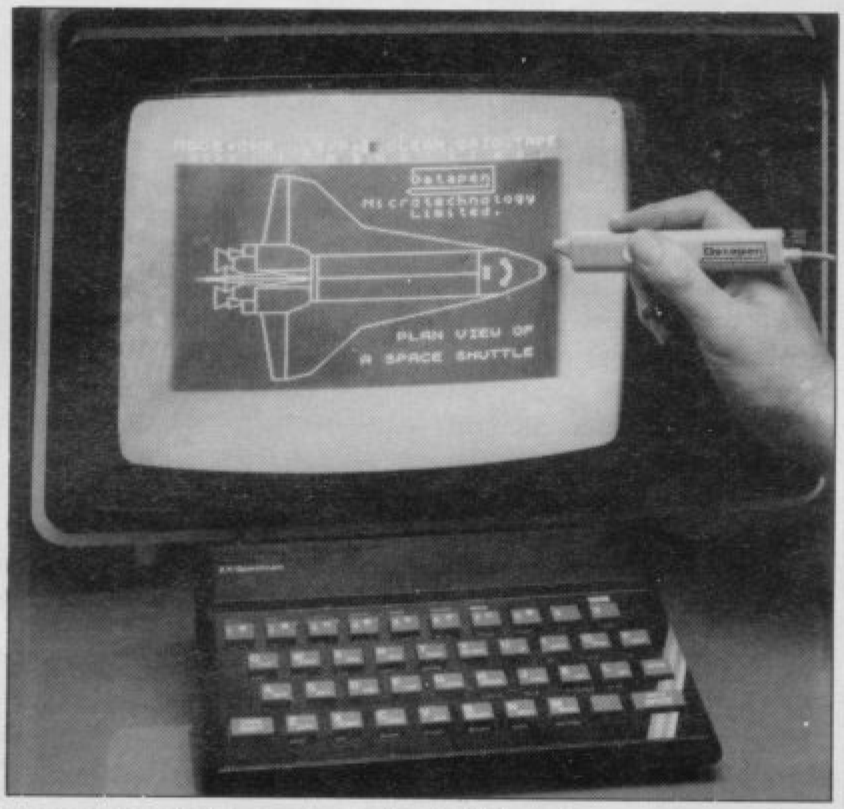
Priced at £4.99, the switch is available from Computer World, 208 Kent House Road, Beckenham, Kent BR3 1JN. Tel: 01-778 0479.

more hardware on page 44

Striking a light

THE DATAPEN, from Datapen Microtechnology Limited, is completely self-contained, all interface electronics being stored within the main body of the light pen.

A light pen is an input device which can be used instead of the keyboard. By using it to point to areas on the screen changes can be made to a display such as option menus. A pen can also be used to draw pictures on the screen and saves time when trying to produce accurate screen diagrams.



The manual supplied with the Datapen is technical in some parts but the information provided should allow most people to get to grips with it. It explains that if you want to use the pen in your own programs you will have to know something about machine code.

One problem found when fitting the light pen was that the interface is dead ended. That means that you will not be able to add other peripherals onto the back of it.

The Datapen is different from other light pens as it incorporates a switch which enables you to use the pen without having to look at the keyboard for guidance. There is also an indicator which when lit tells you that the pen is looking at a light area of the screen and when unlit it is pointing at a dark area.

There are several programs supplied with the instrument the first of which gives an introduction to the mechanics of the pen and how to use it. The other programs show how the Datapen is capable of drawing graphic shapes and the type of accuracy that it can achieve when producing diagrams on the screen.

The Datapen is one of the best light pens on the market and we suggest you check it out before buying anything else. It is available from Datapen Microtechnology Ltd, Kingsclere Road, Overton, Hampshire, RG25 3JB for £29.00.

Competition Zipstick

The new Zipstick from Cookridge Computer Supplies, is a competition-style joystick designed for a long life of furious action. It is compatible with all standard interfaces, such as Kempston and Sinclair, and has the D-type plug on it.

Standing seven inches tall the unit has several good features — rubber feet to stop it sliding and two separate fire buttons, one of which is a bar, while the other is on top of the stick. Made out of ABS high impact plastic with stainless steel springs, it is a good looking, easy to use, joystick and is guaranteed for two years.

Priced at £12.95 inc. p&p, the Zipstick is available from Cookridge Computer Supplies, PO Box 1W9, Leeds LS16 6NT.



Micro cable

AN ALTERNATIVE to the Sinclair Research microdrive extension cable has been brought out by dk'tronics.

The cable is much the same as the Sinclair one and is about eight inches long with a connector plug on each end and a key which will stop you from plugging it into the wrong end of the interface or microdrive.

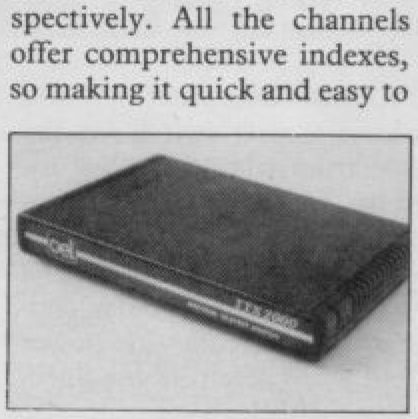
The dk'tronics interface cable is much longer than the one from Sinclair and that helps to reduce the cluttering up of space around the Spectrum keyboard. The cable costs £5.95 and can be obtained from dk'tronics, Unit Six, Shire Hill Industrial Estate, Saffron Walden, Essex, CB11 3AQ.

Teletext adaptor

NEW from OEL is the TTX 2000 teletext adaptor for the Spectrum.

The unit is a decoder allowing you to look at and print out hundreds of pages of information transmitted free with the normal television broadcasts, but usually invisible because teletext is at the top of the screen. The service is free to those with a decoder, normally fitted inside a TV. A TV-type decoder uses a remote key pad whereas the TTX 2000 uses the Spectrum keyboard to access the information.

Teletext is up to the minute information on many different subjects; sport, news, weather, stock prices and even some computer games are included. Both the BBC and ITV transmit teletext, called Ceefax and Oracle respectively. All the channels offer comprehensive indexes, so making it quick and easy to find information. The advantage the TTX 2000 has over normal teletext televisions is its ability to save to tape or microdrive as a screen or to a printer.



Supplied with the decoder are an 18 volt power supply, a manual and a three-way connector lead. All that is then required is a strong television signal.

It costs £143.75 which represents good value and is less expensive than buying a teletext set. It can be obtained from OEL North Pint, Gilwilly Industrial Estate, Penrith, Cumbria, CA11 9BN.

THE AGE OF THE R.A.T



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We've just added the final touch to our professional keyboard.
This new Microdrive compatible keyboard offers more key functions than any other in its price range. And the stepped keys and space bar make it even easier to use. Our keyboard, constructed from high density block ABS, will take your Spectrum into the professional league.
It has 52 "stepped" keys plus space bar. A separate numeric key pad consisting of 12 red keys including a single entry 'delete' plus single entry 'decimal point', facilitate fast numeric data entry.
The 15" x 9" x 3" case will accommodate your Spectrum and other addons like interface 1, power supply etc. and forms an attractive self-contained unit.
All connections, power, Mic, Ear, T.V., network RS232 and expansion port are accessible at the rear.
A few minutes, a screwdriver and the simple instructions supplied are all you need to fit your Spectrum.
All dk'tronics products are covered by a comprehensive guarantee.

Constructed from high density block ABS

All connections accessible at rear



FOLLOW OUR LEAD FOR THE RIGHT CONNECTIONS

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This is an 8" version of the micro 16 way drive lead. Sinclair's lead is only 4" long and for many applications this may not be long enough. It enables you to space the micro drive much further away from Interface I.



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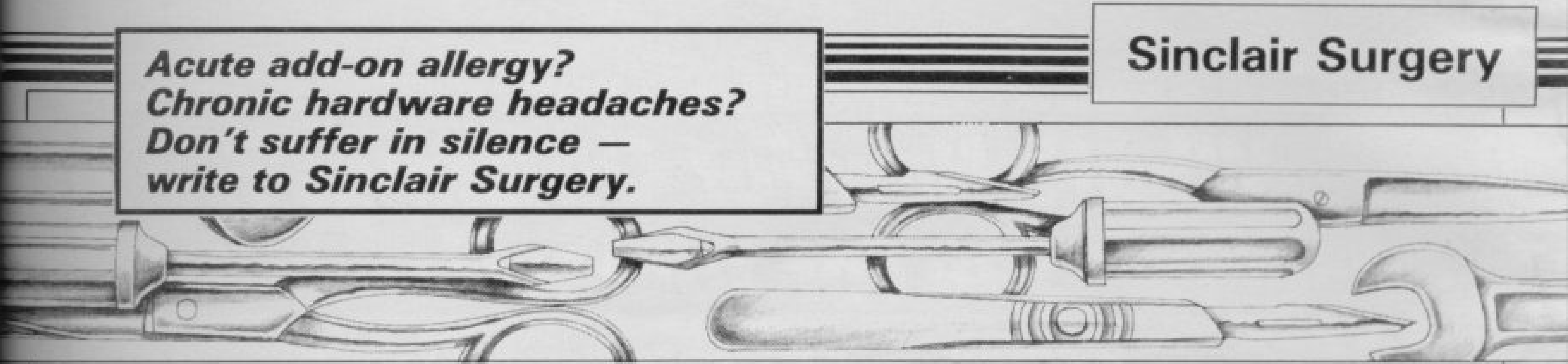
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Fading printouts

COULD you inform me why Alpacom printer paper always fades even if covered in cellophane folders?

Another point of contention is the new blue paper clogs the unit, as does the new black paper.

G W Harrison, Kettering.

● *A spokesperson for Dean Electronics, makers of the Alphacom 32, said that the paper will fade but should last for up to two years if kept out of the light. It was suggested that any listings that you wanted to keep should be photocopied, but again those are liable to fade. That would appear to be a major drawback of the printer and should be kept in mind by prospective purchasers.*

Regarding the clogging of the printer, the spokesperson said that should not happen and any complaints would be dealt with by the Product Manager. Let us know how you get on.

Screaming RAM packs

MY GRANDSON has bought a 16K RAM pack for his ZX-81. When it is attached he cannot run the programs he has typed in. When loading from cassette he gets only a high-pitched scream. He has taken one RAM pack back but the replacement is doing exactly the same.

Mrs J Armitage, Bury, Lancashire.

● *The ZX-81 is well known for its cassette problems but in this case matters seem to have got out of hand. Attaching a RAM pack should not affect the operation of the cassette so something else must be at fault.*

The high-pitched scream is usually an indication that when the program was SAVEd the ear lead was still connected — that should be removed. Other than that, cleaning and aligning the heads usually helps. If that fails then take the computer and cassette to the shop where you bought the RAM pack and try all the stock until you find one that works.

Fitting modems

I HAVE an Interface One and Microdrive, and my Spectrum is fitted inside a Saga keyboard. Can I fit a VTX 5000 modem via the Interface 1?

Mr A R Gardiner, Rhyl, Clwyd.

● *The VTX 5000 Modem was designed to work with Interface 1 so that should not present any problems. However as the Saga keyboard is larger than the Spectrum the front will need to be supported.*

Changing characters

I HAVE bought a Sinclair Interface 2 and have discovered that very few games can be used with it. Is there any way to change the characters, used to control the joystick, to a Kempston or Protek joystick interface?

Chris Bowler, Derby.

● *There is no way to change the characters used by the Interface 2. Your only alternative is to buy a programmable joystick, such as those from AGF or Cambridge Computing, which works on most programs. When buying, always ask for a demonstration to make sure the product does what you want it to.*

Limiting memory

I HAVE recently fitted a new keyboard to my ZX-81 and a curious fault has developed. Although my 16K RAM pack is attached, running the program: 10 DIM A (4000) produces error report code 4 — out of memory.

The above led me to believe my RAM pack was malfunctioning by limiting the amount of memory available. That was not so; large programs work normally, as do any other programs.

D Williams, Bradford, W Yorkshire.

● *The problem possibly lies within the ULA, though you could try changing the CPU (IC3) as that sometimes causes the fault. I am assuming that you do not have RAM pack wobble, though if you are unsure you could buy a ribbon cable from a computer shop.*

Failing keyboards

CERTAIN keys on my Spectrum no longer work — I, Q, A and Caps Shift, and also O, P, Enter and Break/Space. All other keys are functioning.

Stephen Neal, Liverpool.

● *There must be a break in one of the ribbon cables that connects your keyboard to the circuit board. The keys are laid out in eight half rows of five keys — see chapter 23 of the manual — using five data lines and eight address lines. It is one of those address lines which is not connected.*

If you separate carefully the two halves of the Spectrum case and look at the cable with eight wires in it then you may be able to spot where the break is. If you cannot then I am afraid you will have to get a new keyboard matrix. Those are available from a number of sources quite cheaply — you might of course consider getting a full-size keyboard.

Heating problems

I HAVE had a Spectrum 48K for about 18 months. It is the second machine I have had — the first one was returned because after it had been in use for about 45 minutes it ceased to accept information, and I was told that it was probably overheating.

The replacement machine, however, was little different, and I wonder if the power pack is giving out excess current and causing this defect.

J Wallis, Bridport.

● *All Spectrums give out a fair amount of heat and that is nothing to worry about. However if it keeps crashing for no apparent reason then your only course of action is to get it repaired.*

Networking Spectrums

IS IT possible for two microdrives to interchange programs with each other, and is an Interface 1 needed for networking two Spectrums?

Carl Williams, Wallasey, Merseyside.

● *The only way for two microdrives to communicate is via the Spectrum. If you have information in drive one that you want to transfer to drive two then it must be LOADed into the computer and then SAVEd. To network two Spectrums both must be fitted with an Interface 1.*

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Night moves

Mike Rapps brews up a midnight storm using machine code animation

IN THE August issue of *Sinclair User* we investigated simple machine code routines to store and recall, virtually instantaneously, a number of different screens of graphic information to produce simulated animation.

This month we will explore further the possibilities of animating scenes on the 48K Spectrum. The end result is a visual effect which, hopefully, is both interesting and entertaining.

One problem of exploring the technique is that the program which controls the animation is related very closely to the actual screens on which it operates. As these are stored as a literal SCREEN$ it is obviously impractical to convey them exactly. However, illustrations of the three screens used initially appear in Figure 1, and for those who wish to reproduce the screens used, a second illustration of the first screen with a grid superimposed on it — Figure 2 — is provided; the other two screens are, as can be seen, developments from this.

The screens were produced using the **Melbourne Draw** program, and the machine code routines used are largely derived from *Super Charge Your Spectrum* by David Webb, published by Melbourne House. Other routines could just as well have been used to produce other effects, but the main object is merely to illustrate possibilities.

The Basic control program used is listed in Figure 3. That should be typed in and saved: SAVE "storm" LINE 999. Immediately following that should be saved the block of code, a dump of which is given in Figure 4. The code is given in hexadecimal and should be read in rows from left to right. It may be entered using the short loader program listed in Figure 5, letters to be entered in lower case. The dump contains reference numbers underlined to show the first byte of each of the various routines, and should be ignored when entering the code. They refer to the list of routines — Figure 6. When the routines have been entered, they should be saved after the Basic program: SAVE "routines" CODE 32000, 360.

Finally, the three screens used should be assembled into a single block of code using the procedure and the screen storage program given in the August article. That block should then be saved as the third element of the program, immediately after the routines. The screens will commence at address 33000, and should be saved: SAVE "scenes" CODE 33000, 21000.

Let us take a look now at how the action unfolds. It is the dead of night. One by one, the lights of the house on the hill go out. A violent thunderstorm erupts, with lightning casting eerie reflections on the house. The storm abates, the moon rises, the stars come out — even a few shooting stars. As morning approaches, the lights are rekindled.

Figure 1. Three screens

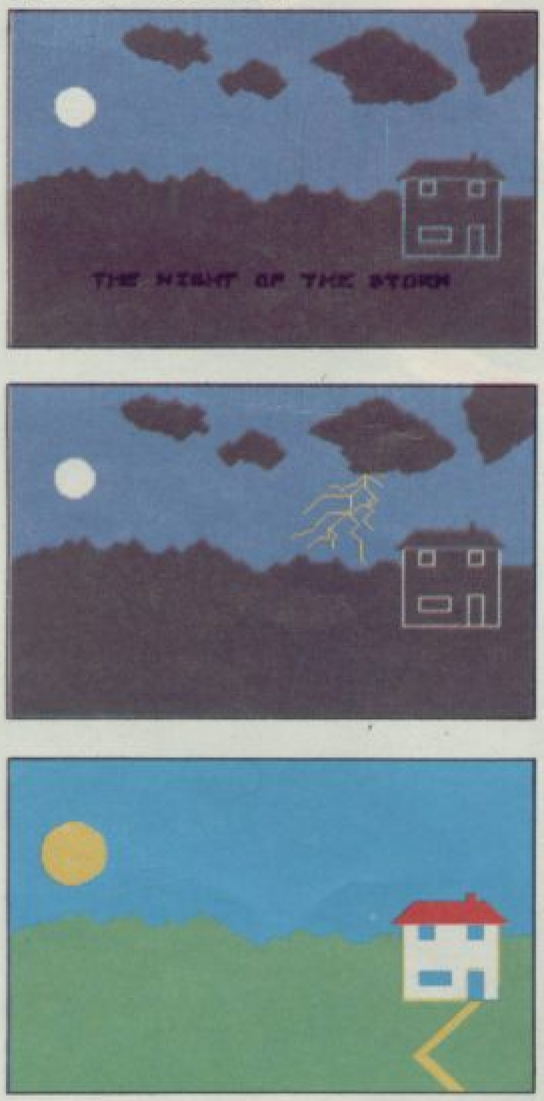
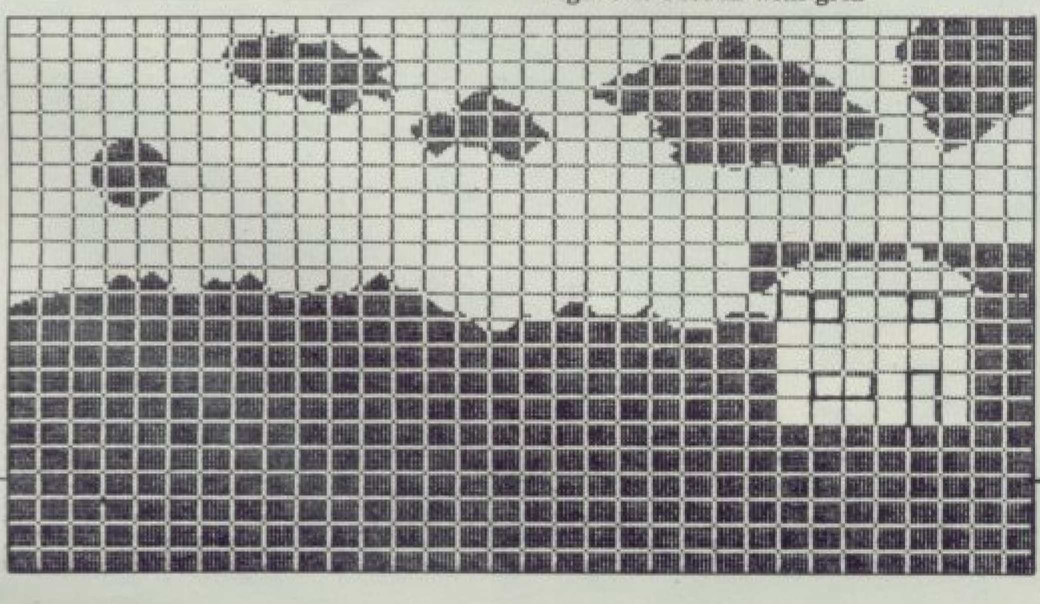


Figure 2. Screen with grid



```
111 e8 80 21 00 40 01 00 1b ed
 b0 c9211 00 40 21 e8 80 01 00
 1b ed b0 c9 0033e 00 4f e6 c0
 0f 0f 0f c6 40 67 79 e6 07 84
 67 79 87 87 e6 e0 6f 3e 37 fe
 c0 d0 91 d8 3c 4f 06 06 7d b0
 6f 3e 1f fe 20 d0 90 d8 3c 5f
 16 00 3a 41 5b 08 43 a7 cb 1e
 23 10 fb 08 a7 ed 52 fe 01 38
 20 28 27 cb fe cb 47 20 02 cb
 be 08 7c 3c 67 e6 07 20 0a 7d
 c6 20 6f 38 04 7c d6 08 67 0d
 20 d2 c9 08 7e e6 40 17 b6 77
 18 e2 08 3e 00 1f b6 77 18 da
 c9 00 00 00 00 00 00 00 00 00
43e 00 4f e6 c0 0f 0f 0f c6 40
 67 79 e6 07 84 00 79 87 87 e6
 e0 6f 3e 4f fe c0 d0 91 d8 08
 0e 00 7d b1 6f 3e 05 fe 20 d0
 91 d8 3c 4f 06 00 c5 e5 11 e0
 5b ed b0 e1 c1 d9 08 a7 28 1e
 47 d9 7c 3c 57 5d e6 07 20 0a
 7b c6 20 5f 38 04 7a d6 08 57
 eb e5 c5 ed b0 c1 e1 d9 10 e3
 d9 3a 41 5b fe 01 d8 20 07 11
 e0 5b eb ed b0 c9 3a 42 5b 41
 77 23 10 fc c9 00 00 00 00 00
511 fe 08 7b 07 07 07 5f 21 00
 40 01 18 00 7e a3 77 23 10 fa
 0d 20 f7 15 20 e9 3a 8d 5c 77
 54 5d 13 01 c0 02 ed b0 3a 48
 5c 77 0e 3f ed b0 c9 00 00 00
616 08 21 00 40 01 18 00 cb 3e
 23 10 fb 0d 20 f8 15 20 ef 3a
 8d 5c 77 54 5d 13 01 c0 02 ed
 b0 3a 48 5c 77 0e 3f ed b0 c9
```

Figure 4. Hexadecimal code

```
  10 CLEAR 31999: LET s=32000
  20 LET z=0: INPUT "Byte ";(s);
"= ";h$
  25 IF h$(1)="s" THEN  STOP
  30 IF LEN h$<>2 THEN  GO TO 20
  40 FOR n=1 TO 2
  50 IF (CODE h$(n)>=48 AND CODE
 h$(n)<=57) OR (CODE h$(n)>=97 A
ND CODE h$(n)<=102) THEN  LET z=
z+1
  55 NEXT n: IF z=2 THEN  GO TO
70
  60 GO TO 20
  70 LET x=CODE h$(1)-48-(39 AND
 h$(1)>="a")
  80 LET y=CODE h$(2)-48-(39 AND
 h$(2)>="a")
  90 POKE s,y+(16*x)
 100 LET s=s+1: GO TO 20
```

Figure 5. Loader program

Program explanation

Line	Explanation
Line 20	Deals with the initial colour settings.
Lines 30-40	The machine code recall routine at 32012 calls in the second screen as a title screen. Before it can do that, the routine has to be given two POKES — in the fifth and sixth bytes — which tell it the start address of the screen to be recalled. A table of which POKEs is given in Figure 7. A text title is printed, with a pause following.
Line 60	Clears the screen, using the routine at 32320
Lines 90-100	Supplies fresh POKEs to the recall routine and calls in the first screen
Line 110	Prints three lit windows on house
Line 120	Pause, then re-calls first screen
Line 130	Prints two lit windows on house
Line 140	As 120
Line 150	Prints one lit window on house
Lines 160-170	As 120 followed by a pause
Lines 200-210	Sets up an outer loop of three, so that the following action takes place three times. On each occasion, a nested loop uses the recall routine, suitably POKEd, to call in the second screen (line 200) followed by the first (line 210) in rapid succession, thus giving the "lightning" effect
Line 220	A further loop produces the 'thunder' — what do you expect on a Spectrum?
Lines 230-240	Pause. Return the outer loop
Line 300	Provides the POKEs necessary to use the rightwards pixel scroll routine at 32025 to scroll away the clouds. The routine works on a defined rectangle within the screen. The rectangle has co-ordinates for its upper left (x1, y1) and lower right (x2, y2) corners. The x co-ordinates are the usual horizontal character positions (0-31), but the y co-ordinates work on a pixel scale (0-175) reading vertically down the screen, not the usual PLOT co-ordinates which read upwards. The POKEs, taking s to equal the routine's start address of 32025, are: s+32, x1; s+37, x2; s+1, y1; s+23, y2. POKE 23361, 0 leaves a clear screen immediately behind the scroll. The POKEs used in the line define a rectangle which covers the clouds
Line 310	Calls the routine set up in line 300 a sufficient number of times to scroll away the clouds, with suitable pauses to slow the action
Line 320	Similar to 300, but sets the upwards pixel scrolling routine at 32150 to operate on the moon. The rectangle co-ordinates are similarly defined, the POKEs being: s+15, x1; s+36, x2; s+1, y1; s+23, y2.
Line 330	Similar to 310, scrolling the moon
Line 400	Sets up a loop for plotting the stars to random co-ordinates. The parameters of the y co-ordinates are set to encompass only the upper sky part of the screen
Line 410	Excludes any random co-ordinates which would plot stars over the moon
Line 420	Carries out plotting of stars, with random colour, and returns loop
Line 430	Saves, as screen four, the existing screen. To do that, the screen save routine at 32000 is used, with appropriate POKEs as set out in Figure 7. In the case of this routine, it is the second and third bytes which must be POKEd.
Lines 500-510	Sets up UDGs for shooting stars
Line 520	Sets screen recall routine to fourth screen
Line 525	Sets up outer loop of six, so that there are six shooting stars, followed by a semi-random initial horizontal co-ordinate for each
Line 530	Sets up inner loop of eight, and prints the shooting star on each return of the loop
Line 540	After a pause, recalls the fourth screen, thus overprinting the star. The star horizontal co-ordinate is then decreased by one, which within the loop makes the star move diagonally across the screen.
Line 550	Returns inner and outer loops
Line 560	Brings house lights back on
Line 570	After a pause, clears the screen using the routine at 32270
Line 600	Resets recall routine to daytime and calls in that screen
Lines 630-650	Opportunity to re-view
Line 999	The auto-run line, which sets RAMTOP to protect the code and loads the two blocks of code.

Figure 3. Basic control program

```
  10 REM 1984 M.J.Rapps
  12 PRINT
  13 PRINT
  14 RANDOMIZE
  15 RUN
  20 BORDER 7: PAPER 0: INK 0
  30 POKE 32016,64: POKE 32017,1
56: RANDOMIZE USR 32012
  40 PRINT  INK 7;AT 17,5;"THE N
IGHT OF THE STORM"
  60 PAUSE 200: RANDOMIZE USR 32
320
  90 POKE 32016,232: POKE 32017,
128
 100 RANDOMIZE USR 32012
 110 PRINT  OVER 1; PAPER 6; BRI
GHT 1;AT 11,25;"(sp)";AT 11,28;"
(sp)";AT 14,25;"(2*sp)"
 120 PAUSE 100: RANDOMIZE USR 32
012
 130 PRINT  OVER 1; PAPER 6; BRI
GHT 1;AT 11,25;"(sp)";AT 11,28;"
(sp)"
 140 PAUSE 100: RANDOMIZE USR 32
012
 150 PRINT  OVER 1; PAPER 6; BRI
GHT 1;AT 11,25;"(sp)"
 160 PAUSE 50: RANDOMIZE USR 320
12
 170 PAUSE 150
 200 FOR n=0 TO 2: FOR f=0 TO 3:
 POKE 32016,64: POKE 32017,156:
RANDOMIZE USR 32012
 210 POKE 32016,232: POKE 32017,
128: RANDOMIZE USR 32012: NEXT f
 220 FOR g=0 TO 30: BEEP .01,-25
: BEEP .01,-30: NEXT g
 230 PAUSE 80
 240 NEXT n
 300 LET s=32025: POKE s+32,6: P
OKE s+37,31: POKE s+1,0: POKE s+
23,55: POKE 23361,0
 310 FOR f=0 TO 200: PAUSE 2: RA
NDOMIZE USR 32025: NEXT f
 320 LET s=32150: POKE s+15,0: P
OKE s+36,5: POKE s+1,0: POKE s+2
3,79: POKE 23361,0
 330 FOR f=0 TO 35: PAUSE 4: RAN
DOMIZE USR 32150: NEXT f
 400 FOR f=0 TO 125: LET x=INT (
RND*255): LET y=INT (RND*70)+105
 410 IF (x>8 AND x<56) AND y>144
 THEN  NEXT f
 420 PLOT  INK INT (RND*6)+1;x,y
: NEXT f
 430 POKE 32001,240: POKE 32002,
210: RANDOMIZE USR 32000
 500 FOR f=0 TO 15: READ a: POKE
 USR "a"+f,a: NEXT f
 510 DATA 1,2,4,8,16,96,96,0,1,2
,4,8,16,32,64,128
 520 POKE 32016,240: POKE 32017,
210
 525 FOR f=0 TO 5: LET m=INT (RN
D*20)+10
 530 FOR n=1 TO 8: PRINT  PAPER
1; INK 2;AT n,m;"A";AT n-1,m+1;"
B"
 540 PAUSE 2: RANDOMIZE USR 3201
2: LET m=m-1
 550 NEXT n: RANDOMIZE : NEXT f
 560 PAPER 6: BRIGHT 1: PRINT AT
 11,25;"(sp)": PAUSE 50: PRINT A
T 11,28;"(sp)": PAUSE 100: PRINT
 AT 14,25;"(sp)": BRIGHT 0
 570 PAUSE 100: RANDOMIZE USR 32
270
 600 POKE 32016,152: POKE 32017,
183: RANDOMIZE USR 32012
 630 PRINT  PAPER 4; INK 0;AT 21
,0;"Do you wish to view again? (
y/n)": PAUSE 0
 640 IF INKEY$="y" THEN  RUN
 650 STOP
 999 CLEAR 31999: LOAD ""CODE :
LOAD ""CODE : RUN
```

Figure 6. List of routines

Start address	Routine
32000	Screen save
32012	Screen recall
32025	Horizontal scroll
32150	Up scroll
32270	Screen clear (fade)
32320	Screen clear (shift)

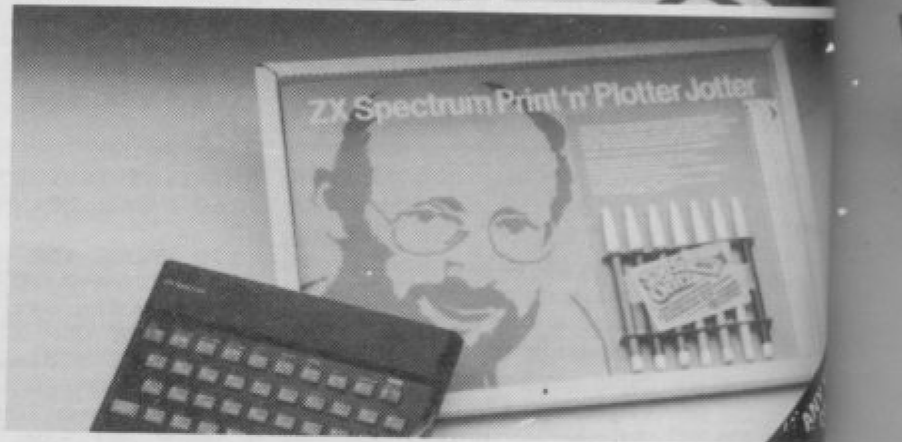
Figure 7. List of POKEs

Screen number	Start address	Poke 1	Poke 2
1	33000	232	128
2	40000	64	156
3	47000	152	183
4	54000	240	210

For screen save routine POKE 1 should be in second byte of routine, POKE 2 in third byte. For screen recall routine POKE 1 should be in fifth byte of routine, POKE 2 in sixth byte.

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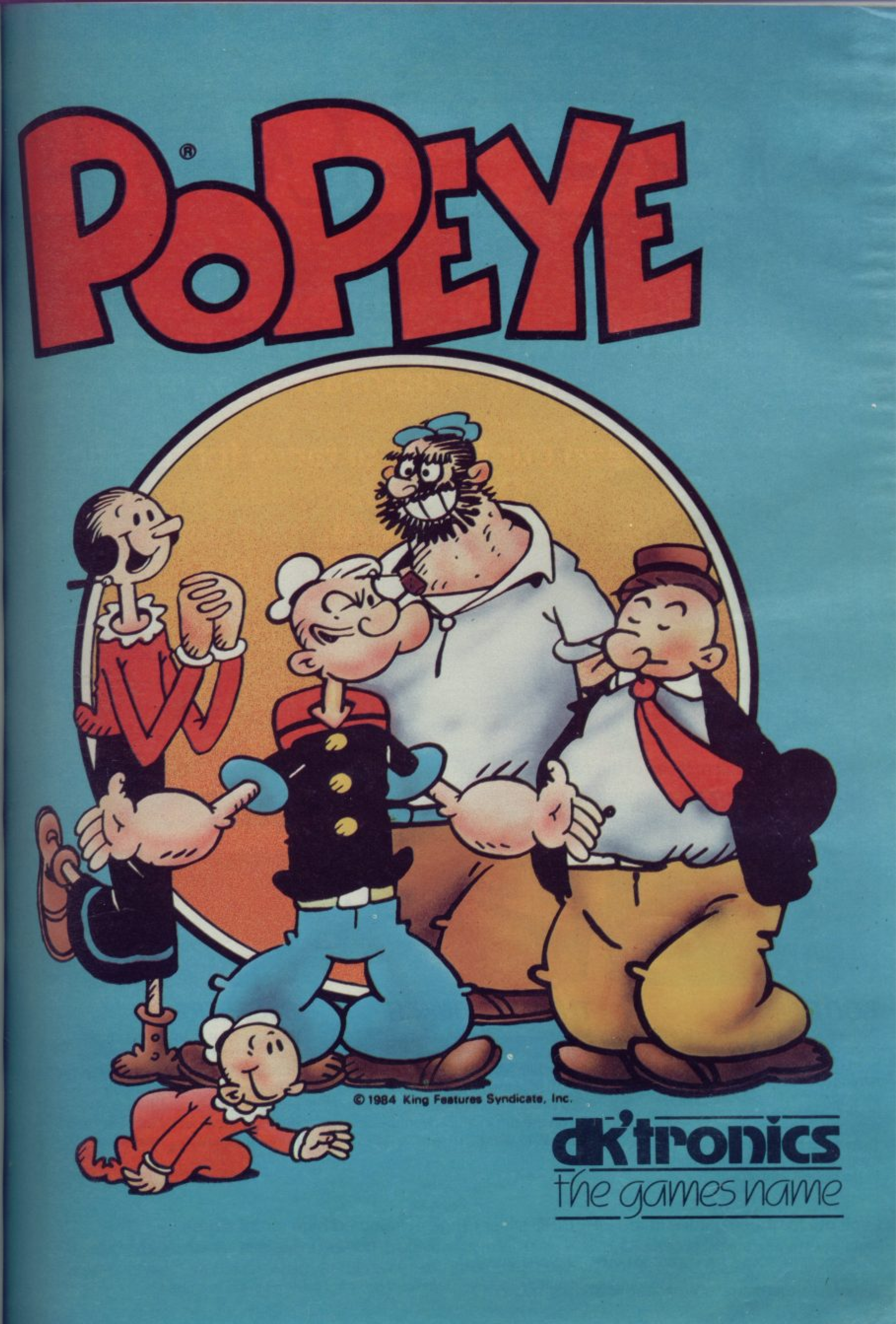
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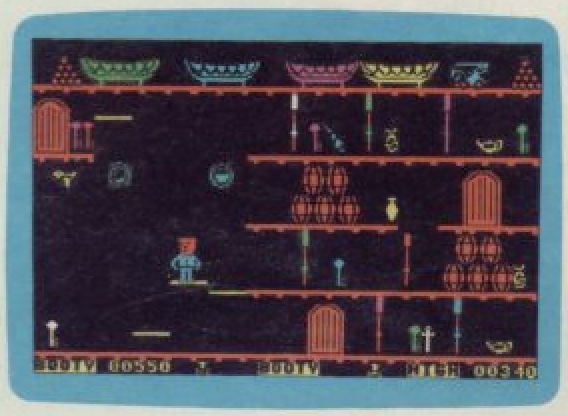
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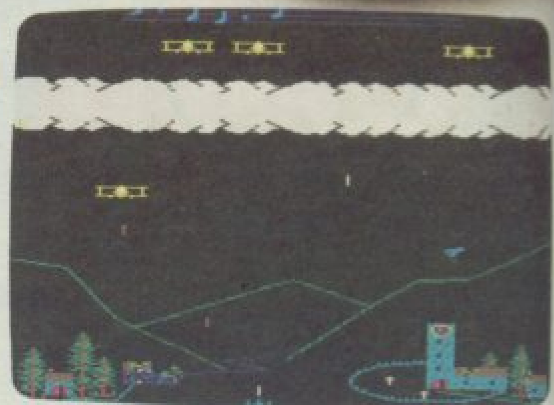
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Modem lovers

Electronic publishing is still in its infancy. Chris Bourne talks to the proud parents



IT ALL started in the garden. Back in the dawn of history, in 1981 to be accurate, East Midlands Allied Press decided that it wanted to get into electronic publishing.

Electronic publishing is simply the presentation of information through some form of computer network. Ceefax and Oracle, the two television information systems, transmit information directly to television sets with the appropriate receivers. Those services are free, as long as you have the right equipment, but limited to pure information, with no opportunity for the user to interact with the system.

The other means of transmitting information is to use an existing network, such as the telephone system. British Telecom originally set up Prestel as a means of utilising spare capacity on the telephone network in the evening.

Prestel sold space on the network for businesses who wanted to set up in electronic publishing, and EMAP decided to use its experience in publishing magazines to provide specialist information to Prestel subscribers. There were, however, problems in setting up the service. Television sets which could receive Prestel were expensive, and you also had to pay a subscription fee and the price of the telephone call every time you used the service.

According to David Babsky, editor of Micronet 800, most of the early Prestel television sets were in travel agents' offices. Despite attempts to allow people to do their shopping on Prestel by ordering goods on credit cards, there were very few home users.

EMAP came into service with Telemap. "EMAP published a magazine called *Garden Trade News,* and decided to start by providing information for garden centre operators who needed to be kept in touch with manufacturers and suppliers. Unfortunately there were relatively few garden operators so it wasn't worth pursuing."

By 1982 EMAP was publishing computer magazines. It was decided to ditch the rather scarce garden centre operators and pursue home microcomputer owners as the ZX-81 was rapidly turning the field into a mass market.

"ZX-81 owners were self-motivated" says Babsky. "They had a keyboard, processing power, and a display in the form of the TV. All that was needed was a telephone connection and a means of presentation."

The black box which connects a home computer to the telephone system is called a modem. You can use a modem for talking to other computers with modems, as well as for accessing databases such as Micronet 800. A modem has two functions. It can send and receive information down the telephone lines and it can interpret the information it receives so that a computer can print it onto the screen. Prestel presents information in lines of 40 characters, but the ZX-81 and Spectrum only use 32 characters per line. The modem must therefore enable the computer to display the information in the Prestel 40-character mode.

The BBC Model B was a gift to the designers of Micronet, because the graphics mode 7 on the machine, the lowest resolution, was identical with the 40-column configuration of Prestel. Suddenly the problems of producing a cheap modem disappeared. The resulting service was called Micronet 800, the 800 signifying that the service began on page 800 of Prestel. Micronet began operating on March 1, 1983 and since then has broadened to include special services for owners of the BBC Model B, Sinclair Spectrum, Commodore 64 and Apple II and IIe.

'Micronet is to the 80s what the Gütenburg Bible was to the Middle Ages'

So what is Micronet, what does it offer, and how much does it cost? The first thing you need is a modem. If you own a Spectrum, then you want the Prism VTX 5000 or alternatively Interface One with any modem, as Interface One contains an RS232 socket to standardise the signals sent out by the Spectrum.

Micronet costs £52.00 a year to join, and once you have paid your subscription you will be given a code number and password. Together, those numbers allow you to access Micronet. It all sounds extremely simple, but in practice there can be problems. For a start your phone must have one of those fancy modern plug-in sockets, because you have to plug the phone into the modem instead of the wall. Secondly, if you are blessed with an exceptionally bad line, with lots of background noise, the central computer may fail to understand your code numbers.

The most popular facility, according to Babsky, is Mailbox. Electronic mail is simply the ability to send messages to other people on the network. It is extraordinary how addictive the idea becomes. Once you discount the cost of the subscription, it is usually cheaper than using the post, and gets round the problem of finding there is nobody on the other end of the phone when you call. You simply obtain the appropriate mailbox number from the list of members and leave your message.

When Micronet first started it budgeted for running the system, obtaining software and similar services. "The one thing we never realised was the enormous number of messages there would be between users," says Babsky. "We had .to find people to route the messages, which meant other areas of growth took a back seat."

Mailbox is a definite advance on the usual Prestel/Ceefax style. The ability to send messages through the system is the core to an interactive database as opposed to a mere encyclopaedia of information. For the first fifteen months of operation Mailbox was only available to people who used the same central computer. Briefly, Prestel and Micronet use a number of computers all over the country, and users telephone the nearest one in order to obtain the cheapest price for the call. Even if you live in Edinburgh and the nearest computer is in Birmingham, an arrangement with British Telecom means you only have to pay at the same rates as a local call. Mailbox thus only operated between users grouped together on one computer.

That is changing. Last month Micronet extended Mailbox to cover a national network, so there is no limit to the number of people you can talk to as long as they are registered with the system.

"The big drawback is that although you can write to each other through Mailbox, or to Micronet itself through the response frames, until recently you couldn't broadcast to everyone over the system," explains Babsky.

Micronet has now altered that state of affairs by introducing Chatline, which allows you to write material directly into the system. Chatline is uncensored, but is carefully monitored, and any obscene or libellous messages are deleted. It only operates between 8 and 10 pm.

The Mailbox system is not controlled at all, and there has been a little trouble at times. But Babsky insists that the

continued on page 70

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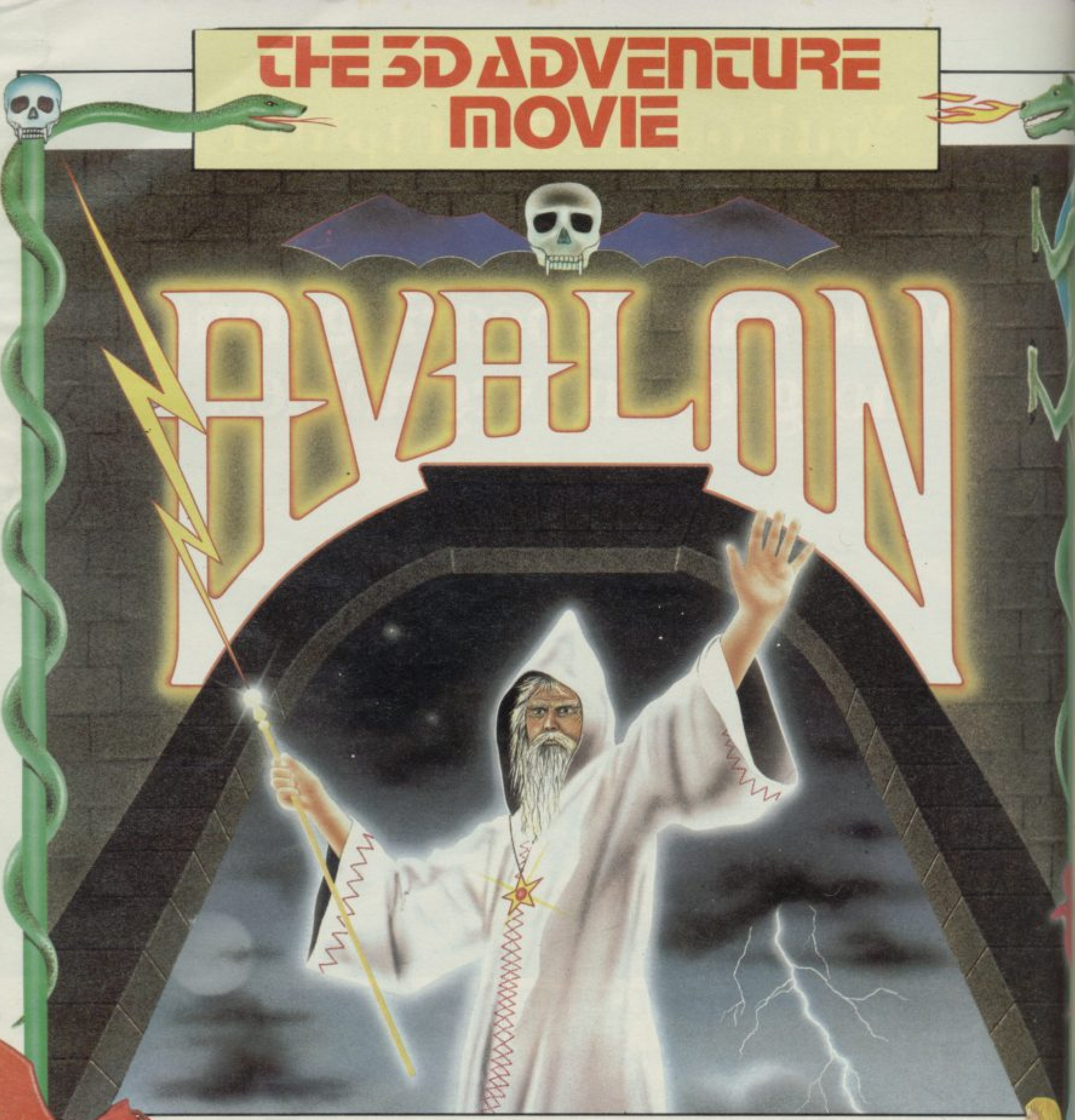
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continued from page 65

system allows for much more effective sanctions than with the telephone or postal services. Any messages which offend, shock, or annoy can easily be traced back to the offender as the names are automatically logged. "We have had only two cases out of 10,000 users where we have had to take action" says Babsky. "One was a man posing as a maintenance engineer who obtained people's ID numbers and used them to send messages to others. The second was a boy who was sending rude messages."

Another service is Contact, which includes sections for those seeking advice about their computers, an adventure helpline, and even a 'lonely hearts' section. Requests such as 'Lonely guy seeks sexy BBC owner, how about a drink sometime?' add a whole new dimension to romance. Love me, love my computer tends to be the plaintive cry of the socially bored hacker. Could you love a man with a Jupiter Ace?

Apart from message sending, Micronet also contains an up-to-the-minute news service. Micronet's news editor, Sid Smith says, "It's akin to broadcasting, except that the difference in technology means you always get information whenever you want. We got news, specifications, interviews and reactions to the QL within two hours of it being launched. We had the first programs for the machine, and the first real hands-on review." Smith is clearly pleased with that particular story, as he has a framed photograph of himself interviewing Sir Clive above his desk.

"We produce a minimum of three new stories a day" he says. "It's very exciting. The pressure is far greater than on magazines. You are telling people things they don't already know."

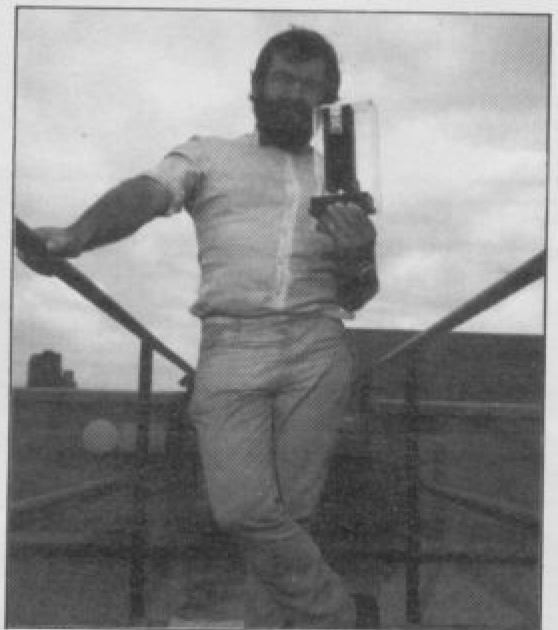
However, the core of Micronet is not the news service — even Sid Smith agrees with that. "We don't think readers want a quick information fix," he says. Babsky is quite clear on the point. Headlines, even for news stories, are deliberately obscure, sometimes to the point of being meaningless. "The object is to provide entertainment and enjoyment rather than an encyclopaedia. We want to make things intriguing. None of the headlines tell you what the subject is about."

Although Babsky's policy is that you should never be more than three steps away from the information or facility you require, the combination of obscure headlines and the general problem of learning how to operate a 'menu-driven' system efficiently can cause problems for newcomers to the system.

It is possible — indeed, easy — to get hopelessly lost within the 40,000 frames of Micronet. "People do complain" Babsky admits. "They are obviously very aware of the money factor. But they say it's still great."

Nevertheless, using Micronet may be cheaper than you think. As long as you are talking to the nearest Prestel computer, you only pay local charges. If you telephone after 6pm then you are spending about 40p an hour. Using the system during office hours is obviously more expensive, but not cripplingly so. An average of an hour a day would cost you £4 a week including the subscription fee.

But it is not the service as it stands at



Babsky with the 1983 Rita Award for System Innovation.

present which is of the greatest interest. Rather, it is what may be made of it in the future. According to Ian Rock, the Marketing Manager of Micronet, there is a general drift away from the light-hearted — some would say silly — aspects of Micronet towards more serious applications.

The advent of a modem for the QL, to be produced by OE Ltd, with luck in time for Christmas, will increase the number of home professional users on Micronet. Micronet is responding with a QL database, including a user magazine and free software. A business service recently available to Micronet subscribers is Computergram, a newsletter published by APT Data Services. Within hours of APT receiving news, it is broadcast on Micronet. The information is worldwide, and covers the upper echelons of the computer market, the financial and competitive shenanigans of such names as DEC, Hewlett Packard, and IBM. "If a story breaks in California, it can be on Micronet three hours later" says Rock. Those *Sinclair User* readers with a substantial stake in IBM had better tune in fast.

The comparative cheapness of Micronet 800 as an interactive database makes it an attractive means of creating an electronic network for clubs and other organisations who cannot afford either the hardware or the subscriptions to large, business orientated systems. For instance, the Labour Party is now operating a private information database on Micronet as an experiment. The party hopes to provide constituency parties with information and news on action groups and other developments of interest to branches.

Prestel itself will start a service aimed at secondary schools next spring, School Link. Micronet is to attack the home market from November with Head Start. "It will provide programs and notes for the 5–12 age group and their parents" says Ian Rock. "Simple ABC stuff first, but will gradually increase the range to O Level. David Babsky has some Shakespeare programs he's very keen on."

Sid Smith feels electronic publishing is science fiction made fact. "There is a real problem of people who have a Spectrum just sitting on the sideboard. It's a cul-de-sac. To link up yours to thousands is remarkable. You are no longer limited to a Z80 based entity."

David Babsky is in no doubt about the revolutionary potential of electronic publishing. "The thing that inspired me most was looking at the Gütenberg Bible, the first book to be printed using moveable type. Micronet is to communication in the 80s what that Bible was to the Middle Ages."

If Micronet is Babsky's Bible, the service certainly inspires great loyalty among its subscribers as well as considerable vitriol from those who complain. The messageboards of Micronet are packed with electronic insults aimed at the way Micronet is run. But according to Ian Rock, there has only been a 5 per cent cancellation rate of subscriptions, which contrasts with around 25 per cent for more conventional publications. That would seem to indicate that Micronet subscribers, whatever the faults of the system, are sufficiently anxious to be part of a new age of communication technology to forgive the present system its growing pains.

For further details contact Micronet 800, Telemap Ltd, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.



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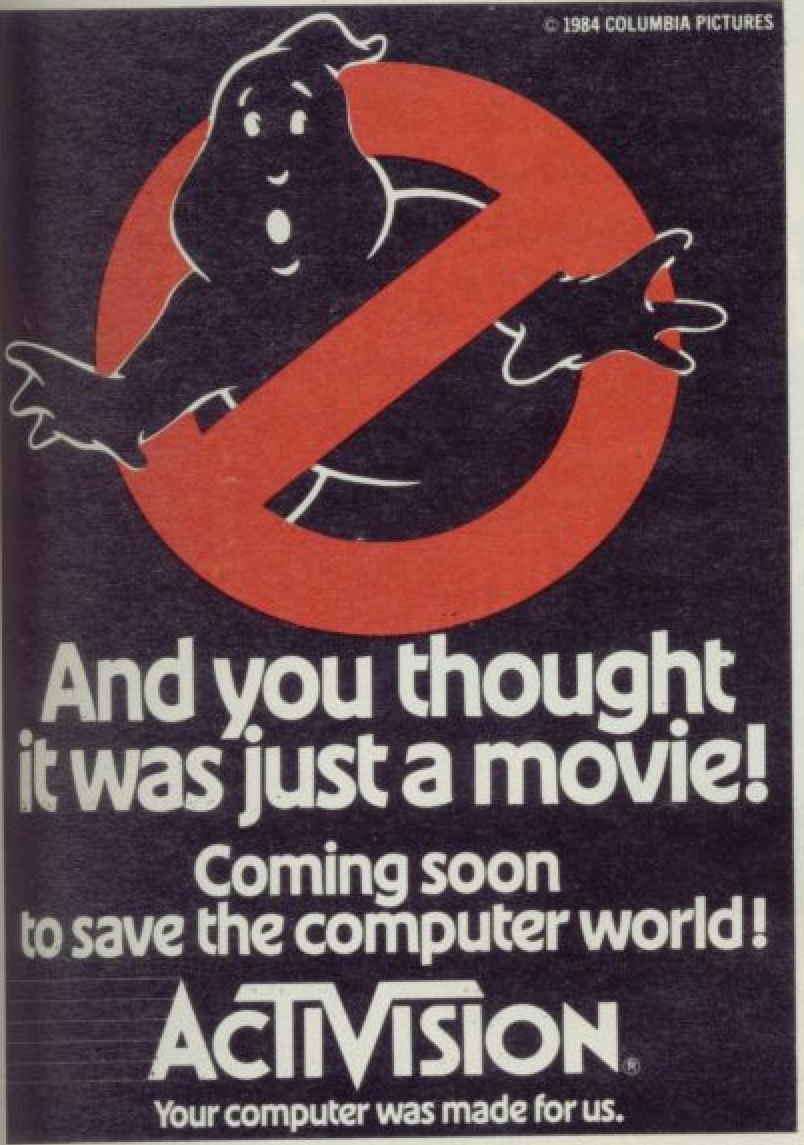
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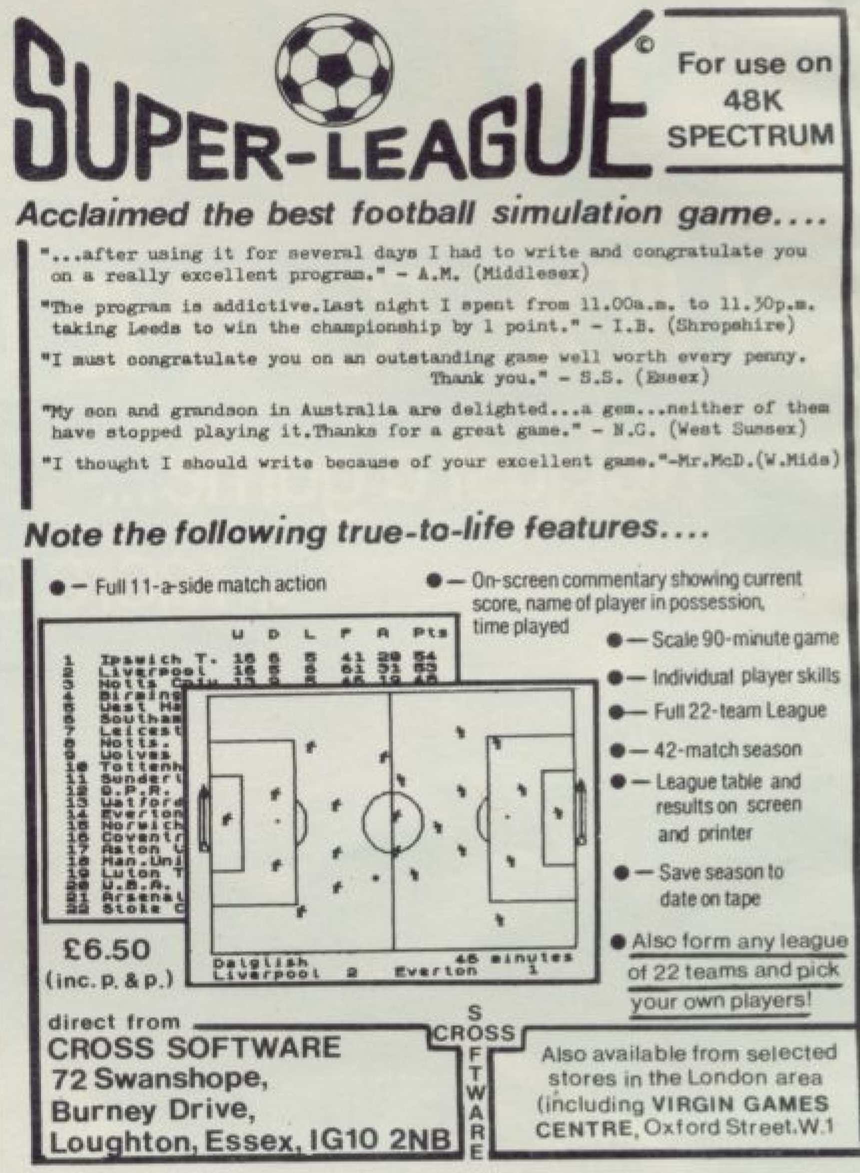
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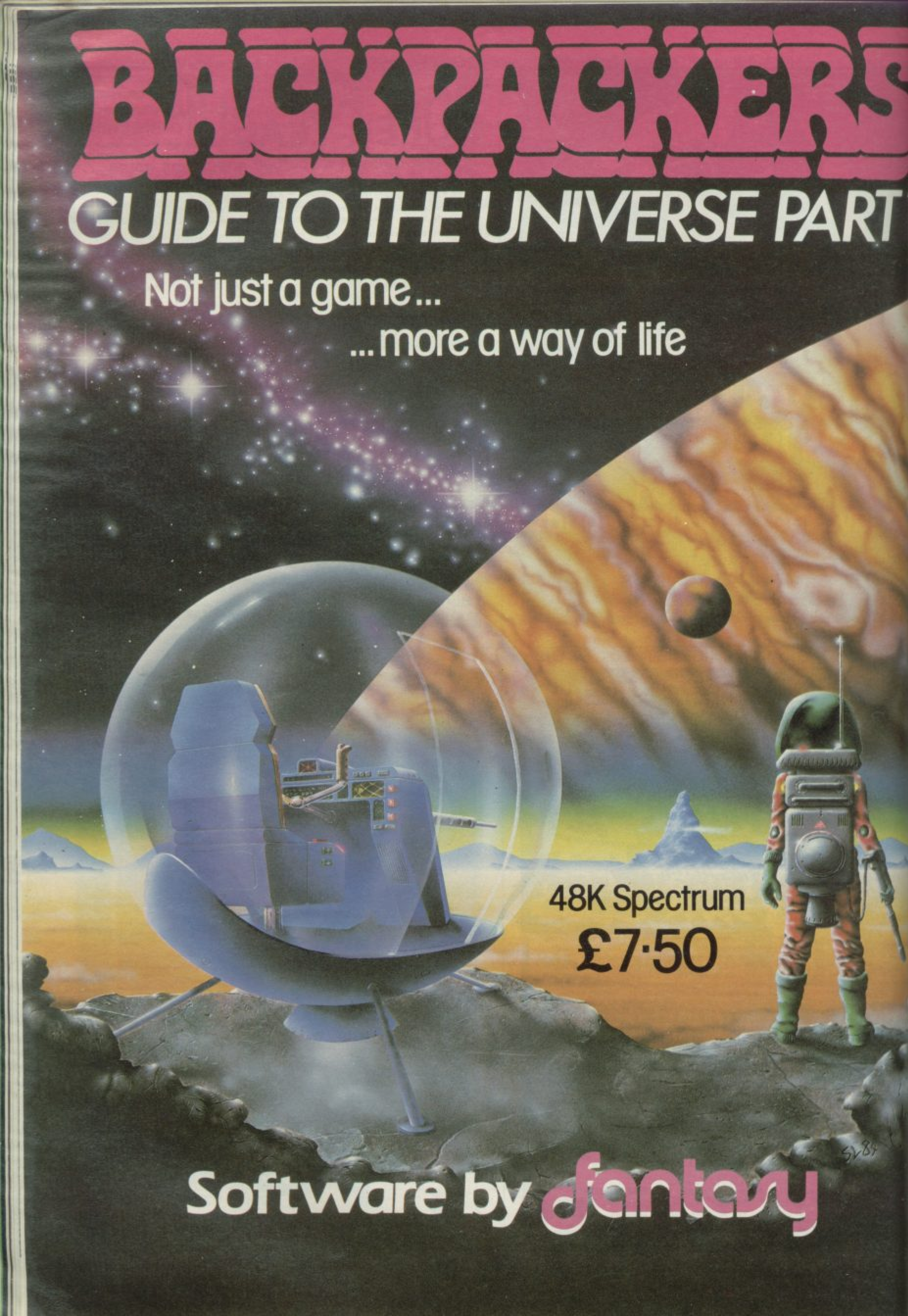
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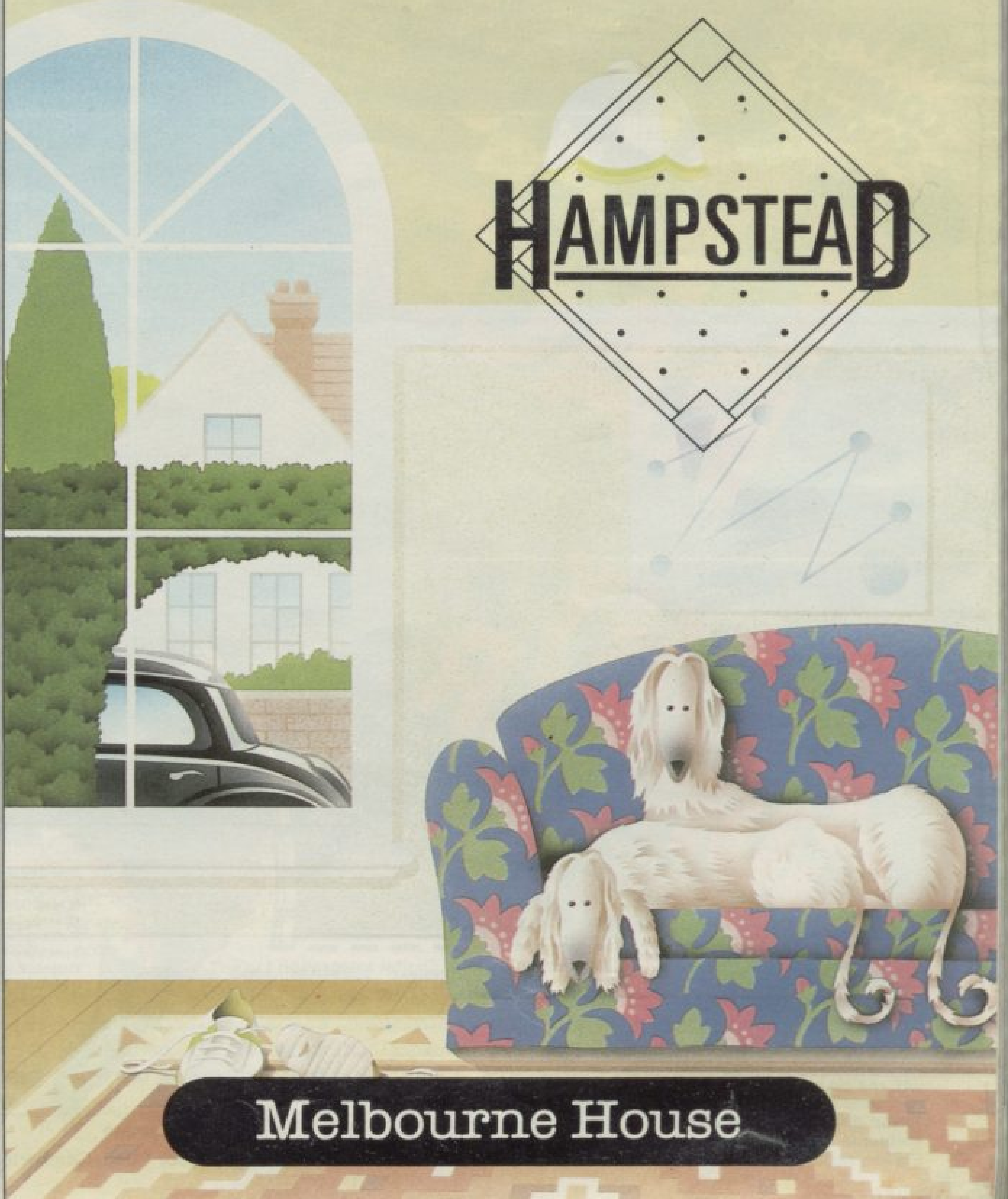
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The fifth generation

Some computer prophets say that the age of the thinking machine is near. They see a world in which machines could be gods of information. John Gilbert investigates the claims.

ARTIFICIAL Intelligence, AI, has become one of the most facinating areas of interest to the computer fraternity.

An underlying interest in the production of 'intelligent' machines has always been evident in the computer world but it has not been until the last six months or so that the subject has caught the headlines in computer magazines and books. The reason for that is the difficulty in writing about a subject which has evolved no terms of reference at a simple level.

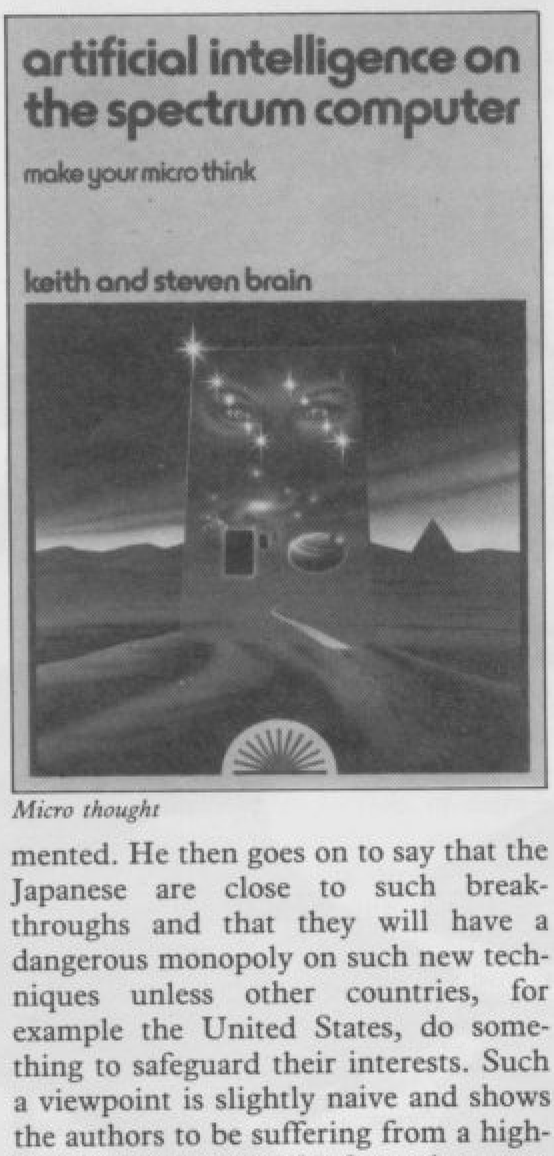
One of the books which has tried to do just that, and failed to some extent, is *The Fifth Generation,* by Edward Feigenbaum and Pamela McCorduck. The attitude of the American authors shows that they have no doubt that fifth generation artificial intelligence within a machine environment is possible. We are currently in the middle of the third generation of microcomputers, which involves integrated circuits. The first and second generations have evolved from gas heated valves and transistor technology. The fourth uses very large scale integrations, VLSI, and fifth generation will show dramatic leaps not only in hardware but in software.

The authors state that artificially intelligent machines will be able to manipulate information and come to conclusions, or reason, on the basis of that data. Unfortunately, their idea of AI seems to be confined to a machine which can amass huge amounts of data, using enormous memory banks, and offer that information to another user in any format required. Many expert systems can do that already and they would in no way be termed intelligent.

Unfortunately, the concept of consciousness, though touched on briefly, is not dealt with in anything approaching enough depth. Some readers will, as a result, feel that the authors have not produced an adequate formulation of the different definitions of AI and have only put across their own views which, they seem to think, are unchallengeable.

Once the problems of terms of reference have been established and cleared the authors then launch into a look at the Japanese innovations in software and hardware techniques. They see information as the next great commodity on the world market and explain that the Japanese with their KIPS, Knowledge Information Processing Systems, are on the way to becoming the next great superpower which could have domination over the USA and USSR, at least in economic terms.

The fifth generation of computers, unlike the last four, will be one in which software, and not hardware, is most important. Feigenbaum says that 'significant levels of innovation' in software techniques will have to be achieved before the fifth generation can be implemented. He then goes on to say that the Japanese are close to such breakthroughs and that they will have a dangerous monopoly on such new techniques unless other countries, for example the United States, do something to safeguard their interests. Such a viewpoint is slightly naive and shows the authors to be suffering from a highly developed sense of information paranoia.



Micro thought

Feigenbaum does, however, redeem himself by admitting that the Japanese need a lead in the new information revolution. He comments that 'Japan's survival as a nation is at stake' unless new quantum leaps in technology are made by that country. What he does not overtly say, however, is that his pessimistic viewpoint about the American lack of interest in the subject is fuelled by the fear that what could happen to the Japanese if they fail could also happen to the United States.

The Fifth Generation, despite its technofear style, is an interesting and digestible book which will appeal to computer historians and prophets alike. Sir Clive Sinclair thinks that it is 'essential reading for anyone concerned with computers' and what greater endorsement could you get than that?

On a more practical note *Exploring Artificial Intelligence on Your Microcomputer* by Tim Hartnell investigates the traditional idea of artificial intelligence. Unfortunately the book might have been better titled 'How to write strategy games or programs which will talk back to you'.

Hartnell's overview of the field of artificial intelligence is informed and concise. It does not side-step the issue but equally it does not go to much trouble to evaluate the terms of reference that were mentioned earlier. To be fair the book is not just another tome of listings. The examples are broken down so that the reader gets a few lines at a time together with a paragraph of explanation. Many of the listings are then reproduced as a whole, although it is not clear if that is to help the reader or whether it is just to fill space.

All the programs use conventional programming techniques and if The Fifth Generation terms of reference were used the book could not be described as a text about artificial intelligence.

To be fair, the author does deal with the subject of Syllogy, an area which figures greatly in the AI debate along with information processing. The area covers forms of deductive reasoning in the style 'if a and b are true then c is also true'. Computers can deal with such relational arguments and can also make the connections between relationships. Hartnell includes a program to show how it is done.

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Although Exploring Artificial Intelligence is more a book for those casually interested in the thinking machine it provides a view of the subject which should appeal to many people who want to improve their programming skills. It takes the reader to an advanced level but, because of the limitations of Basic, does not even touch the realm of what would now be termed artificial intelligence.

The same can be said of *Artificial Intelligence on the Spectrum Computer*, by Keith and Steven Brain. The book contains little information that could not be acquired from good texts on adventure gaming or data processing.

Subjects such as entering English sentences and getting sensible replies from the computer are covered together with short examples which are not particularly imaginative. One good point about the book is that program listings are backed up with flowcharts which detail the techniques which have been used to create the revolutionary new program. That will better enable the reader to adapt techniques to specific programming needs rather than have to wade through the programs.

The authors have, like Hartnell, taken a simplistic view of AI. They see it as a method of communicating with computers and in turn receiving a coherent reply. They also touch on matters such as recognising shapes but make no attempt to distinguish the real points of issue in that area of AI.

The chapter on shape recognition deals only with input from the keyboard and not with senses such as touch, sight, and sound recognition. All those areas are under investigation by computer scientists but none of them are mentioned in detail by the Brains.

If other Sunshine books can include information about setting up hardware for simplified sensor devices then surely the Brains' book could make at least some effort to look at the subject in depth without shying away with a few examples which are old hat to most programmers.

Build Your Own Expert System by Chris Naylor on the other hand, is a welcome relief from the simplistic views of AI given by some authors when dealing with the subject.

The book is about building relational databases which can be questioned in order to obtain specific information. Naylor introduces the random element which occurs in the thought processes of most human beings and which probes for new areas of knowledge. For instance, the author gives an example of a database which will predict what the weather will be like the day after the prediction was made. If it is rainy today and has been raining all week, the chances are that it will rain tomorrow. With that supposition and a knowledge of cloud formations the computer might predict that it will continue to rain tomorrow. If the prediction is wrong the method used by the machine will be adjusted. That might be by providing better knowledge of weather movements or lengthening the odds of certain weather patterns occuring. It is a hit and miss business but it is a better display of AI than any of the books reviewed earlier could muster.

Naylor's book is a must for computer users clamouring for more information about AI or wanting to do something useful with their Spectrums. It is one of the few books worth reading on the subject and, with Naylor's unpretentious skill as a writer, it is certainly one of the most readable. *John Gilbert*

The Fifth Generation, Pan Books, £2.95.
Exploring Artificial Intelligence on Your Microcomputer. Interface Publications, £4.95.
Artificial Intelligence on the Spectrum, Sunshine Books, £6.95.
Build Your Own Expert System, Sigma Technical Press.

Idle worship

Theo Wood examines the case against AI

PUBLISHED earlier this year for the first time in Britain *Computer Power and Human Reason, From Judgment to Calculation* was originally published in 1976, but contains much that is relevant today.

The author, Joseph Weizenbaum, must be considered a heavyweight by anybody's standards; currently Professor of Computer Science at MIT — Massachusetts Institute of Technology – he has had a career in computers since 1950.

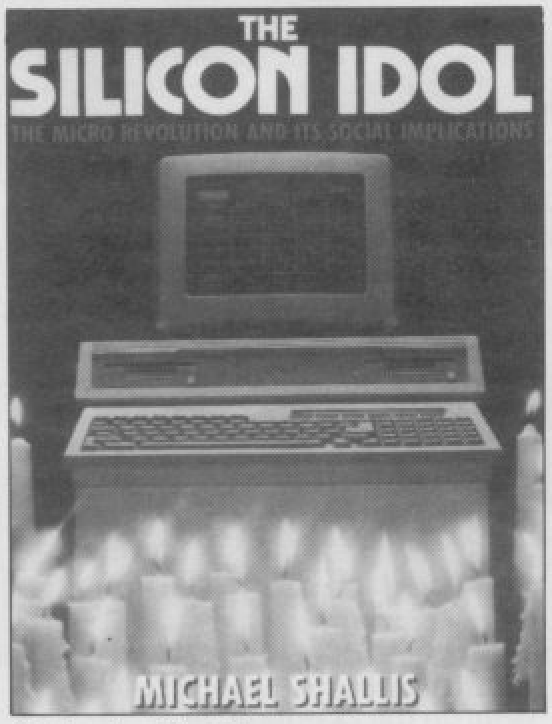
Weizenbaum's book has received a fair amount of media attention, due mainly to the inclusion of a new preface to the 1984 edition. That contained a blistering attack on the computer games fever which has spread across America and Europe in recent years. The main basis for his attack centres on the process of psychic numbing of the individual who plays those games, similar to that which takes place for man to wage modern warfare. It was he also who described the computer junkie way back in 1976.

Although important, those are, however, only peripheral to the central concern of the book, which is a systematic description of how computers work and a similarly systematic attack on the work done by Artificial Intelligence researchers. With books such as *The Fifth Generation* published and Sir Clive Sinclair talking about the wonders of the new technology, it is still worth reading Weizenbaum to place those thoughts within the context of human values.

Weizenbaum doubts that Artificial Intelligence can be anything close to human intelligence, and portrays with scorn such statements made by eminent scholars such as Professor John Macarthy, then head of Stanford University's AI laboratory, who said, "The only reason we have not yet succeeded in formalizing every aspect of the real world is that we have been lacking a sufficiently powerful logical calculus. I am currently working on that problem."

For Weizenbaum the idea that all human activity and thought can be reduced to formal equations capable of being computerised is beyond belief. Having worked on a natural language program, ELIZA, which allowed conversation between the user and the computer as to the user's mental state, Weizenbaum was horrified to find that serious attention was being given to it. Specialists in the psychiatric world were considering the use of such programs in place of human therapists.

Weizenbaum's book is a bellow of anguish from the heart of the computer establishment and, as such, requires some serious attention. However, it is an academic's book in that the main chapters concerned with AI are high-level intellectual infighting. For a more general purpose examination of the social implications of computerisation, Michael Shallis's book *The Silicon Idol* is more suitable.



Cutting down the gods

Depending on which viewpoint it is judged from, the book can either be seen as the work of a Don Quixote tilting at windmills, or of a man trying to communicate the deepest reservations about the introduction of micro-technology into the world of work and human relations. Shallis owes a lot to Weizenbaum for covering the same ground but from a slightly different standpoint. The descriptions of how a computer works are not so comprehensive but, on the other hand, are much more accessible by the reader who may have no previous knowledge of the subject.

For Shallis the suggestion that computers can come anywhere near having what are essentially human characteristics is debasing the human condition. He is particularly strong on the history of computers and intertwined with this the history of man's attitude to service and technology and the power of technology to transform society.

In a world climate of increasing speed of technological change *The Silicon Idol* is ideal for the general reader to take stock of where that change will have maximum impact, as well as its social consequences. Shallis is sceptical of the shining brave new world of high technology, where most of the population do little or no work as we know it in its present form. He reaches the crux of the dilemma when he states that new technology is usually used for economic reasons, replacing humans in both the manufacturing and the service sector, leaving fewer and fewer people to work in factories and offices. Neither does that move to automation provide an alternative to work which is considered dull and repetitive.

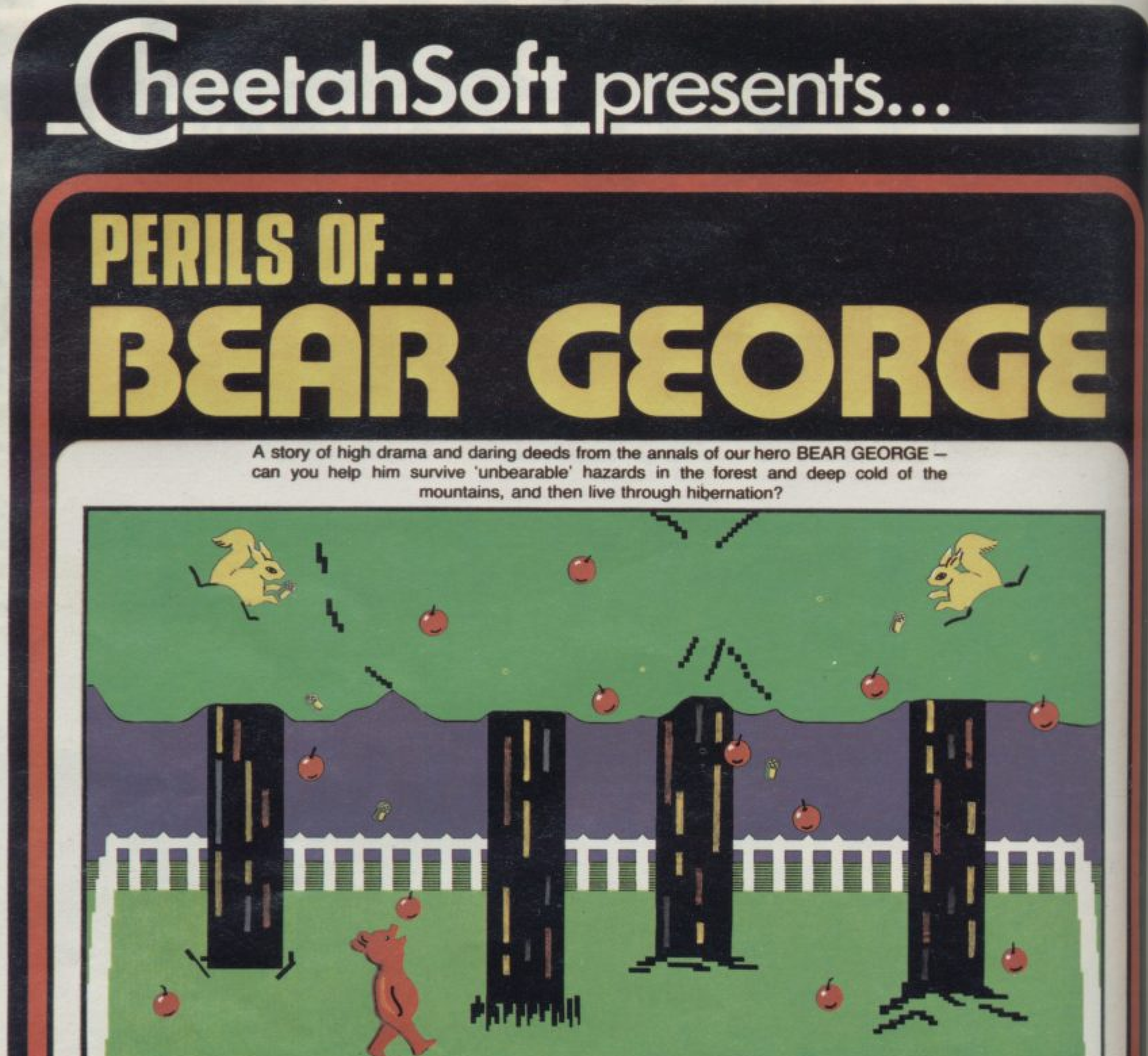
Michael Shallis is an unashamed Luddite and is appropriately pessimistic about the future of work and the social disruption that might cause. He offers no solutions to the problem, merely setting it before the reader in what might be considered a sensationalist and extreme form. In so doing he provides enough fuel for discussion between here and Armageddon.

There seems to be a general consensus that we are in an age of transition, and the two books discussed are important in that they raise issues central to that. Are there activities which computers ought not to be part of? Are computers going to be 'more intelligent' than humans? How are masses of people going to react to enforced leisure/redundancy?

The answers to the first two involve philosophical enquiry, depending on the definition of human intelligence — are we as humans simple input/output devices whose though processes can be reduced to a logical calculus? The third question depends on the way we as a society organise ourselves in the next twenty years. The debate has already begun — it is too important to be ignored.

Theo Wood

Computer Power and Human Reason: From Judgement to Calculation.
Joseph Weizenbaum, Pelican Books, £2.95.
The Silicon Idol: The Micro Revolution and Its Social Implications.
Michael Shallis, Oxford University Press, £8.95.


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Silicon nightmares

Sir Clive Sinclair sees a rosy robotic future. Alexander Macphee, systems analyst, disagrees

SIR CLIVE Sinclair has speculated on a vision of the world of the future, a vision in which, the editorial comment remarked, there was little to cause a raising of the eyebrows. I do not share the editor's eyebrows.

The central ideas in Sir Clive's remarks were firstly that current developments in Computer Science are leading to superintelligent silicon-based life forms and secondly that human problems can be solved by the application of advanced technology. Neither of those assertions is unchallengeable.

The speculation that computers will develop as living beings is a revival of an idea first advanced in the 1950s in Artificial Intelligence studies, often referred to as 'Strong AI'. It is not a new idea, but no more justifiable now than it was then. What is remarkable about those speculations is the number of uncertain, unself-critical and seriously flawed assumptions made, and the seductive use of vocabulary in foreign contexts.

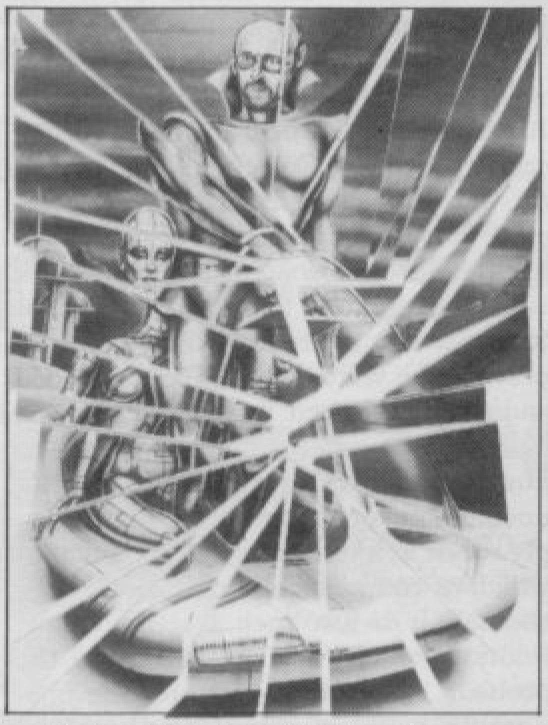
Seriously flawed

The most primitive of those assumptions is that the way in which a computer processes information is in any way similar to or cognate with the way in which a human being — or indeed any other animal — processes information, or even that information processing is the sole or most important attribute of sentience.

There is no reason whatsoever to suppose that the way in which human brains work at the neurophysiological level is in any way similar to the workings of a computer at the electronic bit level. Yet it has always been a human failing to attempt to describe the workings and functions of the human brain in the vocabulary of current technology; formerly as a set of compartments in a Victorian office communicating by memos, later, at the turn of the century, as a telephone exchange switching messages, and currently as a bit-twiddling and byte-shuffling device.

None of these is either valid or instructive, although the computer analogy is clearly more seductive, so much so that as a result of idiot anthropomorphisation people have come to think of human brains as operating like a computer 'brain', a notion which has been reinforced by the use of computing vocabulary to describe human brains. Thus it is an easy step for Sir Clive to turn a computer into a real functioning brain. All you have to do is

". . . . render it intelligent by loading the proper software . . ."



Under that view, thinking is no more than a set of rule-based operations, and the world is no more than a series of puzzles to be solved by primitive and computable rules.

Understanding is not derived from formal rules alone. John Searle demonstrated that in his Chinese Room analogy in *The Behavioral and Brain Sciences.* A man with no knowledge of Chinese is locked in a room. He has a script in Chinese — which he doesn't understand — together with a set of formal rules in English — which he does — which enable him, when given lists of Chinese symbols, to construct other lists of Chinese symbols, which he can pass back out of the room. Unknown to him, his Chinese script is a story, the list of symbols he is given is a list of questions, and the list of symbols he constructs are really answers to the questions about the story, which are indeed understood by native Chinese speakers. In what sense can that mechanical, rule-based symbol manipulation be called understanding?

Staggeringly stupid

Those areas that are claimed as successes in the field — the so-called 'expert systems' — owe their success to the fact that the conditions under which they operate are strictly defined, as are the problems which they are designed to solve. 'Expert' is, of course, another of those seductive words. Another example often quoted is the success of some chess programs. Here the restriction of operation to a rule-based and context-free world is signally clear.

Sir Clive also confuses knowledge with data when he proposes that "acquired knowledge of a man" could be given to a computer by "the transfer of data from human to machine mind". Yet those two are not synonymous, the implication being that knowledge is no more that a large database of context-free atomic facts, by which definition human knowledge therefore becomes reducible to logical formalism.

Sir Clive also speculates that these intelligent computers will evolve as silicon-based life forms, able to reproduce themselves. I wish I could be generous but that seems to me to be staggeringly stupid. Again the seductive use of vocabulary with human connotations continues with use of words like "see", "feel", "sensory devices". Optical or physical devices may indeed be used to supply information to a computing device, but the significance of those as sensory devices is a matter of interpretation. The ballcock in a water tank performs a sensory function, but I do not attribute to it the phenomenon of sensation.

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It may be argued, however, that if the machine appears to show intelligence we may never know the difference, the Turing test frequently being invoked. The Turing test, however, is not a test to divine the existence of intelligence, rather it is a measure of the level at which we can be fooled into believing that the responses we detect may be coming from an intelligent source.

Moral dilemmas

Suppose, however, we allow that machines can think in a way cognate with or — superior to human beings. That then raises moral dilemmas of massive proportions. If we have truly created intelligent life then presumably this life form is entitled to what we regard as fundamental human rights. With the concept of life comes the concept of death and killing. The question is by no means trivial, for Sir Clive offers those "superintelligent" life forms as "menial slaves" to human beings. In what sense could beings of such superior intelligence be treated as menial slaves?

The second offering of Sir Clive's speech is of high technology as solutions to human problems. Here he is on equally shaky ground. He is not unique in that, for it is common to propose the salvation of the world by throwing technological solutions at human problems. This is doomed to failure because the problems themselves are not technological, but human and social.

What are the major problems faced by humanity in the twentieth century? And what is the role of advanced technology in solving them? They are not difficult to identify: hunger, poverty, war, unemployment, health, freedom, education, housing. The size of the list is as distressing as its content.

None of those problems is a merely technological problem; indeed, for many of them we know what the solutions are. What we lack is the collective human willpower and trust to take decisions to implement the solutions to end these problems. The immense effort and logistic enterprise used to transport the men, machinery and materials of warfare and mass public death around the world might equally be used to feed and clothe the sick and the hungry. We have massive food production capabilities, but most of the world is hungry. It is the human application to the solution that is missing, not the solution itself.

Technological solutions show equally great poverty of inventiveness in areas of unemployment. Sir Clive at least acknowledges the unemployment problems — though not the consequential problems — created by advanced technology. He believes those are only temporary; he does not say why. He believes those will widen horizons, he does not say how. He says ". . . . goods are still needed but . . . technological change will remove virtually all employment".

Who will buy the goods? And with what? In what way will the wealth (if any) created by this new Technological Revolution be distributed among those who, unemployed, have no part in it? Who will own the means of wealth production?

Sir Clive believes rather that our lives will parallel the lives of the Freemen of Athens. But the world in the twentieth century is not a City-State, and not all the inhabitants of Athens were Freemen. Poverty and misery were not absent in Periclean Athens, nor did educating children to an appreciation of the finer things in life do anything to prevent the wars which sapped, eroded and finally reduced Periclean Athens.

Where, however, human solutions to human problems seem difficult, it is not uncommon for the problem to be simply recast as a technological problem, to which of course technological solutions abound. It is just such a technological solution which Sir Clive offers to the problem of crime. He ignores the relationship between crime and the social problems of unemployment, deprivation, poverty, poor housing; instead, the 'solution' is to implant in the 'criminal' a device linked to a computer.

He dismisses fears of an Orwellian society by saying that we could offer a choice to miscreants. This dismissal fills me with fear and alarm. It presupposes that any State given such control *would* offer an alternative, it applies a narrow definition of what people would recognize as a miscreant, it presupposes that the definition of a miscreant would not be 'adjusted' to include anyone who opposed the State in any way.

Plain silliness

That is not mere speculation on my part: the technology of surveillance has already been widely and illegally applied in this country to people who were not criminal in any sense of the word, as exemplified in a recent case. I am not sure if what Sir Clive demonstrates is innocence, naivete or just plain silliness, but our liberty should rest on stronger foundations than unproved declarations of benevolence from the State.

Even the problems of loneliness in old age are cast by Sir Clive as technological problems for which, of course, the solution is a quickwitted robot, not humanity, caring, love, compassion, or understanding. Those are qualities which, if they have them, people have from an understanding of human problems, human ills, human sufferings — in short, by being a human being sharing in those fears and difficulties with which so much of life is fraught. It is not clear how those attributes or properties could be shared by a robot.

A more persuasive application, perhaps, is in the field of education. Sir Clive argues that we can — and presumably therefore should — have our children taught by machines. Yet here again his arguments are faulty. Education does not consist of instilling a list of facts. It is, above all, a social process, not a mechanistic process. Apart from set topics dealt with in the classroom there is also the 'hidden curriculum' of learning — what it is to be human — be being in the company of, and interacting with, other human beings.

Robots may, however, be convenient for some in that they may never have the human attribute of accountability for their errors, a feature that is often found useful in computers when it comes time to lay blame at someone's door for some error.

What is really distressing about Sir Clive's views, however, is not so much that they seek to describe computers or robots as a special kind of Man, but rather they describe Man as no more than a particular kind of robot. If that is a vision of the real future, I hope it arrives with the punctuality for which Sinclair is renowned.



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SPECTRUM 48K
THE EDGE

The standard of QL software has been set by Metacomco. John Gilbert investigates

The first bytes

WHEN A NEW microcomputer, such as the QL, is launched critics and users alike expect the first few pieces of software which appear on the market to be rushed efforts, written sloppily in a high level language and containing many bugs.

Although few software packages are available for the QL the machine and its manufacturers have been extremely lucky in that what does exist is of a high quality. A case in point is the new **Assembler Development Package** from Metacomco, a company which has almost single-handedly provided an insight into what the QL can do.

The package consists of an assembler and full-screen text editor and is a result of several years of experience in 68000 programming by its principal author Dr Tim King. It uses the full 68000 instruction set and provides access to the much-vaunted multi-tasking abilities of the Sinclair machine.

The editor part of the package is more complex and robust than many which are available on other microcomputers. It has to be because although 68000 assembler language is easy to learn it can become complex when writing applications which require a great deal of code.

It provides a user-defined window, initially at the centre of the screen, which can be changed both in position and size to suit the needs of the user. It is also possible to define other windows and run a version of the editor in each so that several files can be entered into the QL simultaneously and edited one after the other. You might, for instance first decide to do some work on the file in window one and then change some lines listed in window two. Switching between the windows is a simple matter of pressing a few keys and makes complex editing tasks much simpler than they would normally be. It is possible to squeeze 12 windows onto the screen and have 12 files in memory at the same time but the text within each is only just legible.

The editor will allow the entry of any ASCII file. So, you could type in assembly source listings, data files or even high level language programs, de-bug them and save them to microdrive. The full screen layout means that you will no longer have to cope with the simple line editor with which the basic QL has been equipped.

Innovations such as automatic word-wrapping have also been included. Word-wrapping has been the province of word processors where if a word ran off the edge of the screen the computer would put it onto the next line. It would then space out the rest of the sliced line so that it appeared as a block of text and the last character on the left- and right-hand margins were aligned vertically.

Once you have entered your assembly



language file, either from microdrive or by hand, there are a variety of options available through which you can correct errors and amend programs. When you enter a long program you will see that the user-defined window through which you can look at the text may only display part of the source program because you have changed the margin settings. In such a case the program lines can be scrolled horizontally and vertically across a specified window.

Other options include copy and delete functions which allow blocks of code to be copied into various sections of memory, exchanged for other sections of source, or deleted altogether.

Some simple de-bugging aids such as Search and Replace will also make your life easier when manipulating source code. Those will allow you to change all occurences of a string of characters within the source and then replace it with another piece of code. For instance, you might have used a block reference label several times within a program but then decide that it no longer represents the function of that block or you can think of a more apt name with which to describe it. By using Search and Replace you can remove the label and insert a new one.

The real ability of the editor lies in its ability to link or merge files of source. A file can be entered from microdrive and inserted at any point within one which is already resident in memory. That will not only prove useful when you find that an extra piece of code needs to be added to a program, but you can also start building up a library of memory-independent subroutines, which can be placed anywhere within the RAM and be used in several programs.

In order to assemble the source code it has to be saved from the editor and loaded into the assembler. The source can be loaded from a specific part of memory, made position-independent, or relocatable. In the last case a relocator routine is added to your code which can then be put into any spare section of memory by the QL. The first of those options will probably be used when only one short program is to be assembled and where it is not difficult to calculate the exact extent of any jumps that are required to other addresses with the program.

The second option is more important. It can be used with long programs which you may want to alter frequently and do not want the bother of changing memory address references.

The three-pass assembler takes approximately one minute to do its work and requires three program overlays to be loaded in from microdrive before it finishes all of them. The reason that, like some of the Psion software packages, all of the assembler does not fit into the memory at one time is that the error messages take up 10K of internal RAM. Each message is written in English and not the mumbo-jumbo that has become the industry standard and is hard to decipher unless you have the manual to hand.

If an error is found in the source listing while assembly is taking place the process is stopped and the line upon

continued on page 90

continued from page 89

which the mistake has been found is flagged by a cursor at the beginning of the statement. The error message is displayed at the bottom of the screen and a correction can be made cleanly and easily by re-editing the source.

The most powerful aspects of the assembler package are the ability to make routine requests to QDOS, thus plugging into the power of the QL operating system, and being able to create and call macro directives.

A macro is a series of commonly used instructions which can be packaged into one routine and given a label, or name. Those instructions will be executed in sequence when the name of the macro is called within a program.

A large number of ready-made assembler directives are included within the package. Those include the usual ORG and EQU instructions which ensure that a piece of code is assembled at the correct location and produce the nearest thing to Basic variables within assembly language. Other directives include conditional assembly of source code, the setting of boundary size for data areas and the formatting of the code display on any device including screen and printer.

The development package was still at the Beta test level when we looked at it. That means that it is the finalised version minus full de-bugging and the addition of routines recommended by the de-buggers.

The assembler quickly showed, however, that the QL is a very powerful machine when the restrictions of SuperBasic are lifted. The package is a sophisticated piece of software which not only uses the QDOS operating system but also allows the user to gain access to that elusive beast. It is the first assembler onto the market and will obviously not be the last.

Metacomco has no such problems with its package as the software was defined before the QL saw the light of day. Dr Tim King, had to make few changes to the specification to allow it to run on the QL as the specification of all 68000 chips is very closely linked. The company believes that it could sell the same product on an upmarket micro to clients who would be prepared to pay £400. The QL development package is to be sold for £60 which represents an astonishing switch in marketing policy that, if folowed by other companies of the same stature of Metacomco, will certainly lower the price expectations of businessmen.

Just as the price of hardware has fallen rapidly, partly due to the innovations of Sinclair Research, so the prices of sophisticated software packages will fall because companies which have established themselves at the top end of the market will see a reason to move down, reducing prices of existing products, dumping them to other machines, and taking customers with them.

A further innovation, admittedly started by WH Smith with the Advance computer but followed by Metacomco, is the introduction of such serious packages as the assembler into chain stores.

The new moves will produce a better standard of software on the shelves of high street shops and they bode well for the future of the microcomputer market if the Metacomco Assembler Development package indicates the shape of things to come.

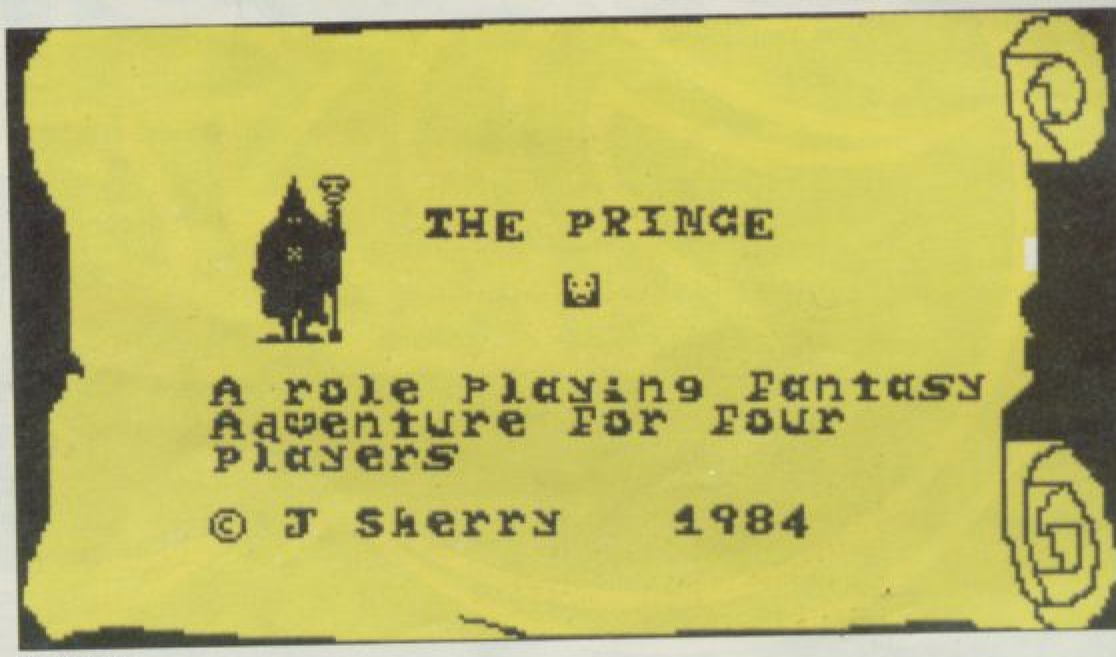
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Gilbert Factor: **9**

1984 CAMBRIDGE AWARDS

HISTORY was made at the Ritz Hotel on October 4 when the first multi-player interactive adventure game for the Spectrum was unveiled. Entitled **The Prince,** and written by John Sherry of Keele, Staffordshire, the game won the 1984 Cambridge Award for Programming organised by *Sinclair User* and Cases Computer Simulations. Nigel Searle, managing director of Sinclair Research, presented John Sherry with the trophy and a cheque for £2000.

The Prince is an adventure for four players, set in the walkways, courtyards, dungeons and battlements of a rambling mediaeval castle. Each player competes against the others to complete the quest and gain audience with the Prince. To help him in his task the player can hire spies and henchmen to report on, and hinder, the progress of the rival players, though frequently those servants will be double agents, in the pay of more than one player, and are not always to be trusted.

Only one player can see the screen at one time, accessing it in turn with his personal code number. Alliances can be made with the other players both on and off screen, and gradually a web of intrigue is created as all four protagonists indulge in vicious in-fighting, trapping each other in the dungeons and ambushing the henchmen.



The Prince

There were also four second prizes of £250 each and those were awarded to Steven Thomas of Luton, Bedfordshire; Thomas Frost, of Argus, Scotland; Nicholas Holgate of Camberley, Surrey; and David Bark of Stranraer, Scotland.

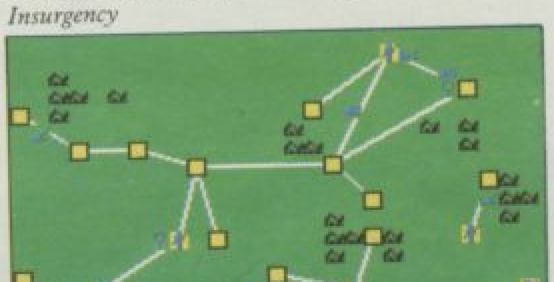
Steven Thomas submitted **War Zone,** a fast graphic wargame in which the player battles with the computer to gain supremacy of a large territory. **1942 Mission,** from Thomas Frost, is a wartime adventure involving the infiltration of enemy lines by a lone commando in search of a top secret document. Nicholas Holgate wrote **Insurgency,** a detailed strategy game set in an unstable country where guerrillas and government forces fight for control of the native population using propaganda and military strength. Finally, from David Bark came **Blue Riband,** a realistic simulation of navigating a large vessel through the tortuous channels and inlets of a group of islands.

All five prize-winning entries will be published by CCS and on sale for Christmas. The standard of the entries was consistently high and the judges found the final choice a difficult one. The runners-up, who each win five computer games from CCS are: **Columbus, Phoenix Tower, One Million Years BC, Superpower, Guadal Canal, On the Road, Air Defence, Badminton, Stock, Golden Amulet, Airways, Golden Cobra, End Game, Strategic Descent, Monopoly, D Day, Shift-Shaft, Wizard Killer, Chinese Farmer, Final Frontier, Battlestar Galactica, Shopping Trip, Spy, Sceptre of Power.**

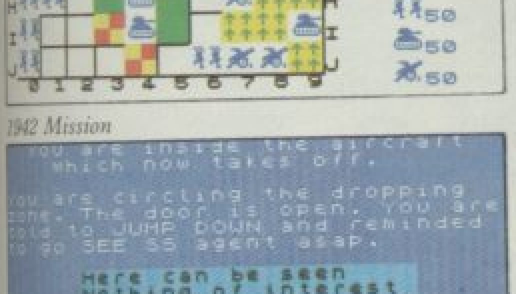
Warzone



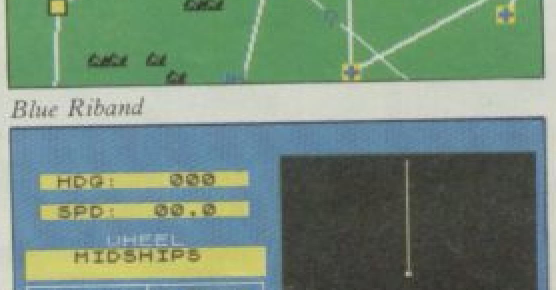
Insurgency

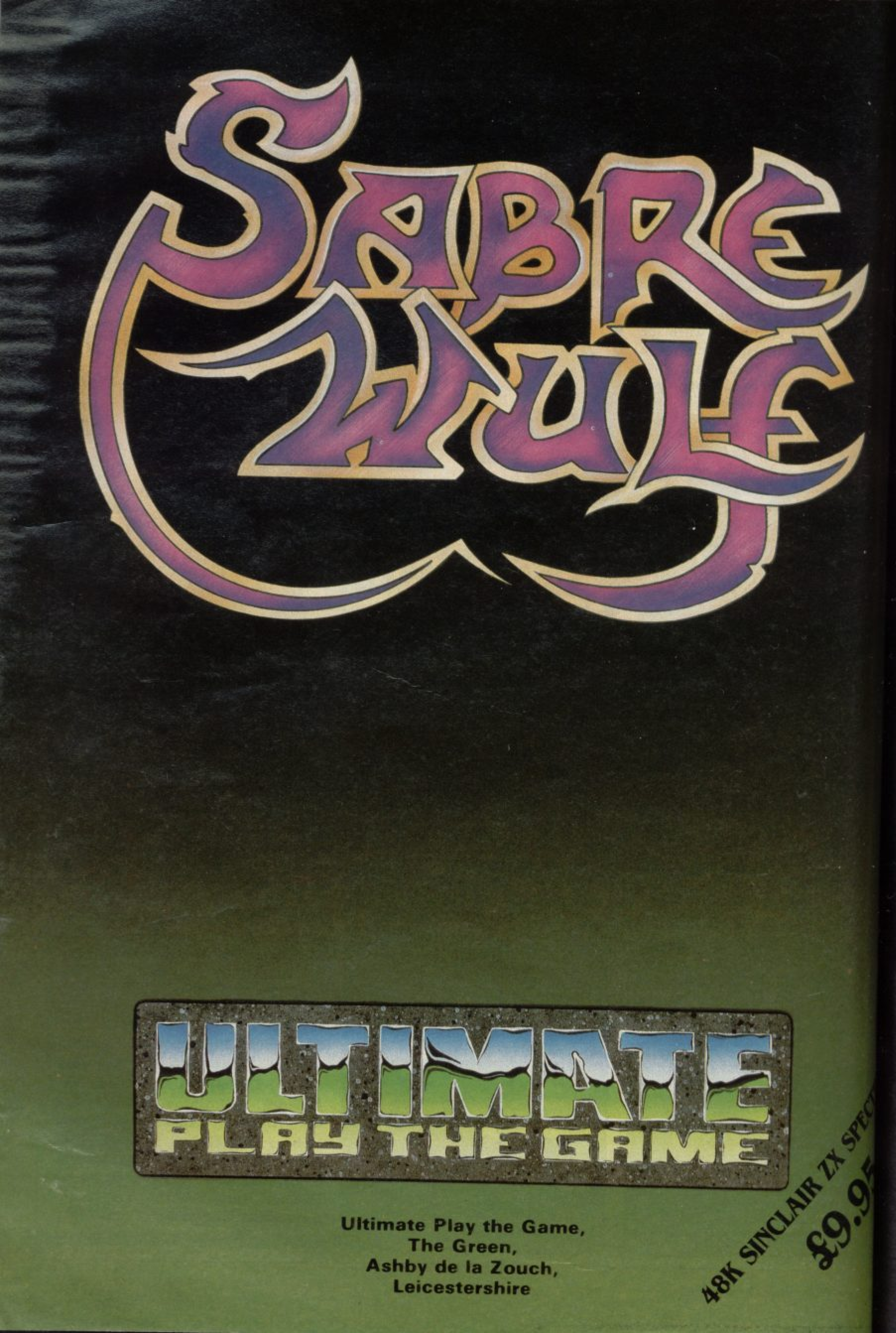


1942 Mission



Blue Riband



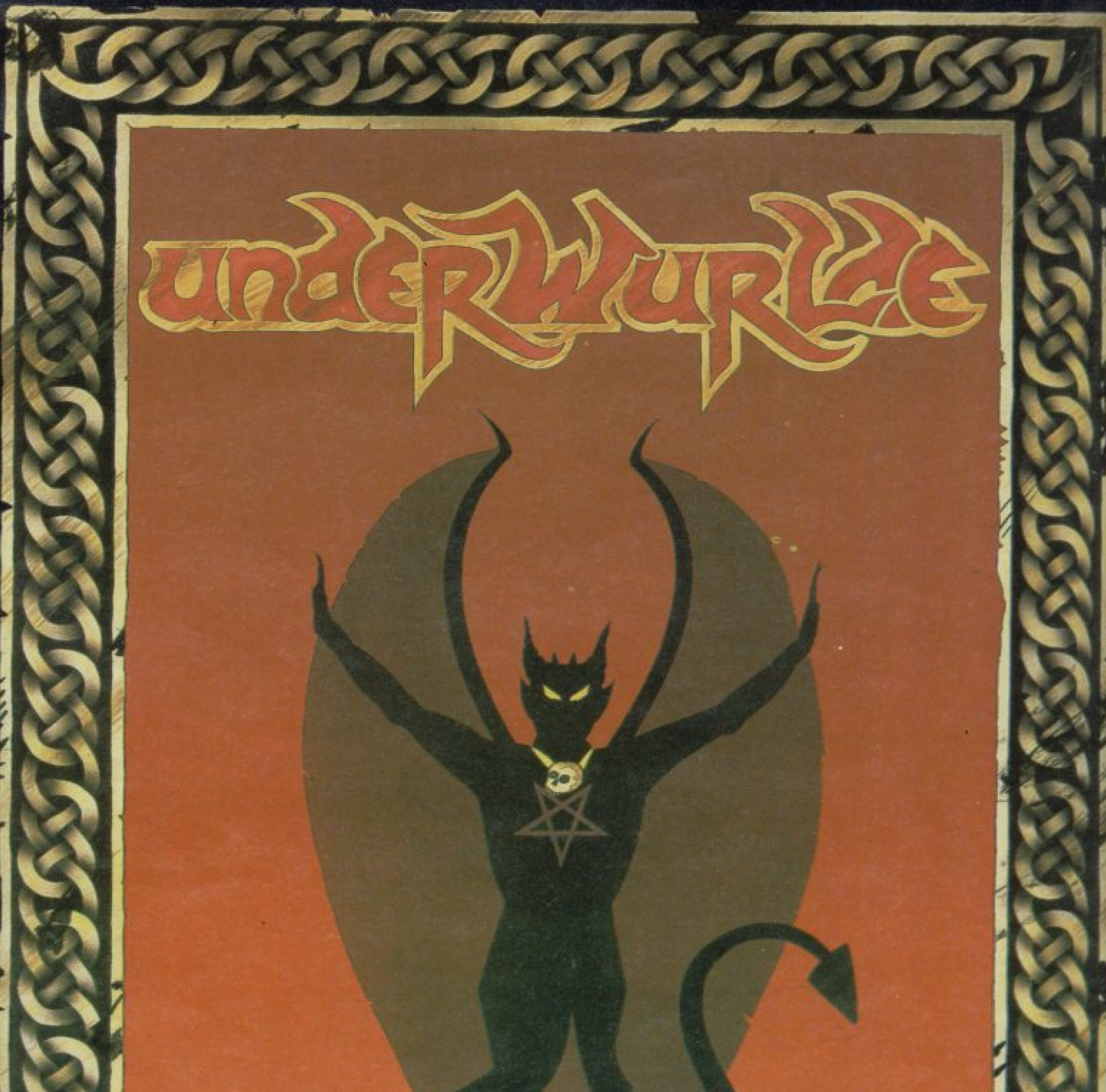

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SHERLOCK The most eagerly-awaited adventure of 1984. Does for Conan Doyle what The Hobbit did for J R Tolkein - and it's written by the same author as The Hobbit. The action takes place in Victorian London and you, as Holmes, must unravel the mysterious cases that turn up. 800 word vocabulary, SAVE feature. Load: 7 mins. **(Melbourne House) £14.95**

THE WRATH OF MAGRA *"This is a great game and it could take a lifetime to solve it ... well worth buying"* (Micro Adventurer). *"I can wholeheartedly recommend the programme... the scale of the undertaking is so enormous that it soon becomes an absorbing task"* (PCGames) Load: 6 mins x 3 episodes. **(Mikrovision) £12.50**

COMPLETE MACHINE CODE *"THE BEST MACHINE-CODE TUTOR.... no serious Spectrum programmer should learn machine-code without it"* (Crash). *"During the few hours I have used this package, I have learned more than I did in several days of grappling with books on the subject* (HomeCompWkly). **(New Generation) £14.95**

CRUSOE *"If you are looking for something a bit beyond the conventional adventure this is one to try"* (Micro Adventurer). *"Uses colour, graphics and sound well, offering good value and many hours of sometimes frustrating fun. I recommend it"* (PopCompWkly). Load: 6 mins. STIX: none. **(Automata) £6.00**

GIANT'S REVENGE The sequel to JACK AND THE BEANSTALK (£5.95). Has the same amazing graphics and is just as difficult. These two arcade games are too difficult for some reviewers - so unless you are pretty hot stuff with a joystick, don't bother! Currah Speech will talk. Load: 4 mins 30 secs. STIX: Kempston. **(Thor) £5.95**

MATCH POINT *"The ultimate yet in sports simulation"* (Crash). *"Provides some of the most spectacular graphics for the Spectrum....outclasses most other sports progams....can be described as a true simulation"* (SUser). Load: 4 mins 20 secs. STIX: Kempston, Interface 2. **(Psion) £7.95**

MONTY MOLE *"SUPERB....the graphics are of Ultimate quality and the design of the game is so clever and the problems so fiendish"* (PopCompWkly). Monty Mole goes coal snatching at his local Yorkshire pit - can he fill the bucket before the pickets get him? Can you help Monty to surface in King Arthur's castle? Some of the profits go to the Miners Welfare Fund. 21 levels. Load 4 mins 55 secs. STIX: Kempston, Interface 2. **(Gremlin) £6.95**

RAPSCALLION *"I enjoyed it, think it will be a hit, and want to come back for more... a game that is enjoyable with long-lasting appeal"* (Crash). In this fully-animated cartoon adventure Rapscallion the Rogue has seized your castle and thrown you into the dungeon, but a princess transforms you into a bird...! Demo of 14 of the rooms. SAVE feature. Load 5 mins 20 secs. STIX: Sinclair, Kempston, Fuller, Protek. **(Bug-Byte) £6.95**

WHITE LIGHTNING *"White Lightning is the best package I have used on the Spectrum. Its features and flexibility are second to none and have to be seen to be believed.... the less experienced will be able to have a go without fear of getting bogged down.... tremendous value for money!"* (PCN). Telephone help-line from the makers. This must be the best key yet to creating and selling your own programs, 130 page manual, 2 cassettes. **(Oasis) £14.95**

DEUS EX MACHINA *"It's like a breath of fresh air... it is a completely new computer experience...brings the drama of the widescreen epic to computer software.... a brave new idea"* (PopCompWkly). New from Automata, this is like nothing else you've seen! Audio cassette takes you through the game simultaneously - John Pertwee, Frankie Howard, Ian Dury talk, Mel croucher plays. Mind-blowing! Load: 4 mins 45 secs. **(Automata) £15.00**

CURRAH SPEECH Makes your Spectrum talk. Use it with talking games, and/or teach your Spectrum to say any word or sentence you like - in English. Free demo cassette and talking adventure. If you wish to use a joystick as well as Currah Speech, you will also need the CURRAH SLOT expandable motherboard. This lets you plug any two things into your Spectrum with/without Interface 1. **CURRAH SPEECH £29.95. CURRAH SLOT £14.95**

LORDS OF MIDNIGHT *"THE game for the Spectrum... something completely new ...a superb game and a must for all 48K Spectrum owners"* (PCGames). *"One recent adventure stands head and shoulders above any others ... quite breathtaking"* (PersCompNews). *"Simply in a different league from graphic adventures that have gone before"* (YrComp). Load: 4 min 48 secs. STIX: None. **(Beyond) £9.95**

FOOTBALL MANAGER *"An excellent simulation, enjoyable to anyone with the slightest interest in soccer"* (PersCompNews). *"Excellent use of colour and graphics... almost as exhausting as playing"* (ZXComp). Load 3 mins 24 secs. STIX: None. **(Addictive) £6.95**

FULL THROTTLE *"It's superb! The 3D is some of the best I've seen. The game itself is fun to play and is exhilarating ...91%"* (Crash). *"Great fun and very well done indeed...my favourite feature is the skid"* (PersCompNews). Load 2 mins 55 secs. STIX: Kempston, Interface 2, AGF, Protek. **(MicroMega) £6.95**

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Total Order	

PROGRAM PRINTOUT

Mars Man

GRAPHICS INSTRUCTIONS

Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.



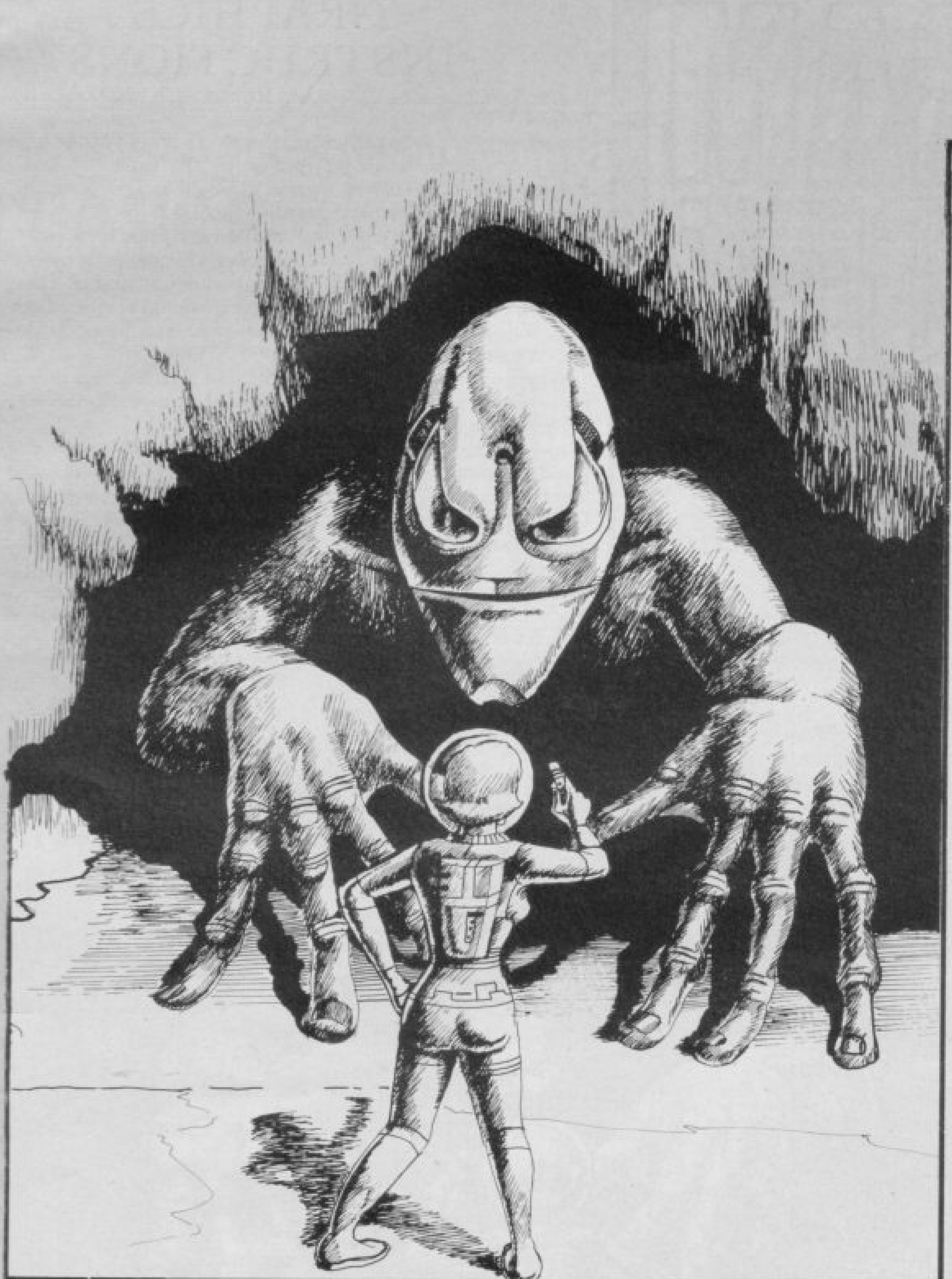
YOU are a prospector for a mining team, seeking gold in the airless caverns of Mars. As luck would have it, the caverns are ruled by a fearsome monster, which will try to devour you. Pick up as many nuggets as you can before your air runs out.

Mars Man was written by Colin Hunniford of Birkhampstead in Hertfordshire for the 16K ZX-81. Make sure you have the right number of characters in the initial REM statement to store the machine code.

```
   1 REM MMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMMMMMMM               $ M
MMMMMMMMMMMMMMMM 240 CHARACTERS M
MMMMMMMMMMMMMMMM AT LEAST        M
MMMMMMMMMMMMMMMM                 M
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMMMMMMMMMMMMMMMMM
   2 SLOW
   3 GOTO 1165
   5 CLS
  10 LET P=0
  15 POKE 16418,P
  20 FOR I=P TO 11
  30 PRINT "
          ........................
..........."
  40 NEXT I
  45 PRINT AT 23,P;"         +++
MARSMAN+++         " AT 1,1;"

  50 POKE 16418,2
  55 FOR I=1 TO 19 STEP 2
  60 LET D=INT (RND*29+1)
  70 PRINT AT I,D;"H";AT I+1,D;"
H";AT I+2,D;"H"
  80 NEXT I
  85 LET Z$=" "
  90 DIM X(4)
 100 POKE 16514,212
 105 LET X(1)=1
 110 POKE 16515,2
 115 LET X(2)=-1
 120 POKE 16516,P
 125 LET X(3)=33
 130 POKE 16517,P
 135 LET X(4)=-33
 140 POKE 16518,232
 145 LET A=PEEK 16396+PEEK 16397
*256+66
 150 POKE 16519,3
 155 LET B=64
 160 POKE 16522,P
 200 PRINT AT 0,0;"     SCORE:";T
AB 14;"   OXYGEN      "
 210 POKE A+B,CODE Z$
 220 LET B=B+P
 230 LET Z$=CHR$ PEEK (A+B)
 240 IF Z$="," THEN LET Z$=" "
 250 POKE A+B,178
 260 IF Z$="+" THEN GOTO 640
 270 IF USR 16529=0 THEN GOTO 31
0
 280 LET P=X(INT (RND*4+1))
 290 IF PEEK (A+B+P)=128 OR B+P<
0 THEN LET P=0
 300 GOTO USR 16710
 310 POKE 16418,0
 311 PRINT AT 0,24;"0"
 314 LET K$="    YOU HAVE RUN OU
T OF AIR.    "
 315 FOR I=0 TO 15
 320 PRINT AT 23,0;"     YOU HAVE
 RUN OUT OF AIR.     "
 330 PRINT AT 23,0;"    YOU HAVE
 RUN OUT OF AIR.    "
 340 NEXT I
 345 FOR I=2 TO 22
 346 PRINT AT 1,1;"

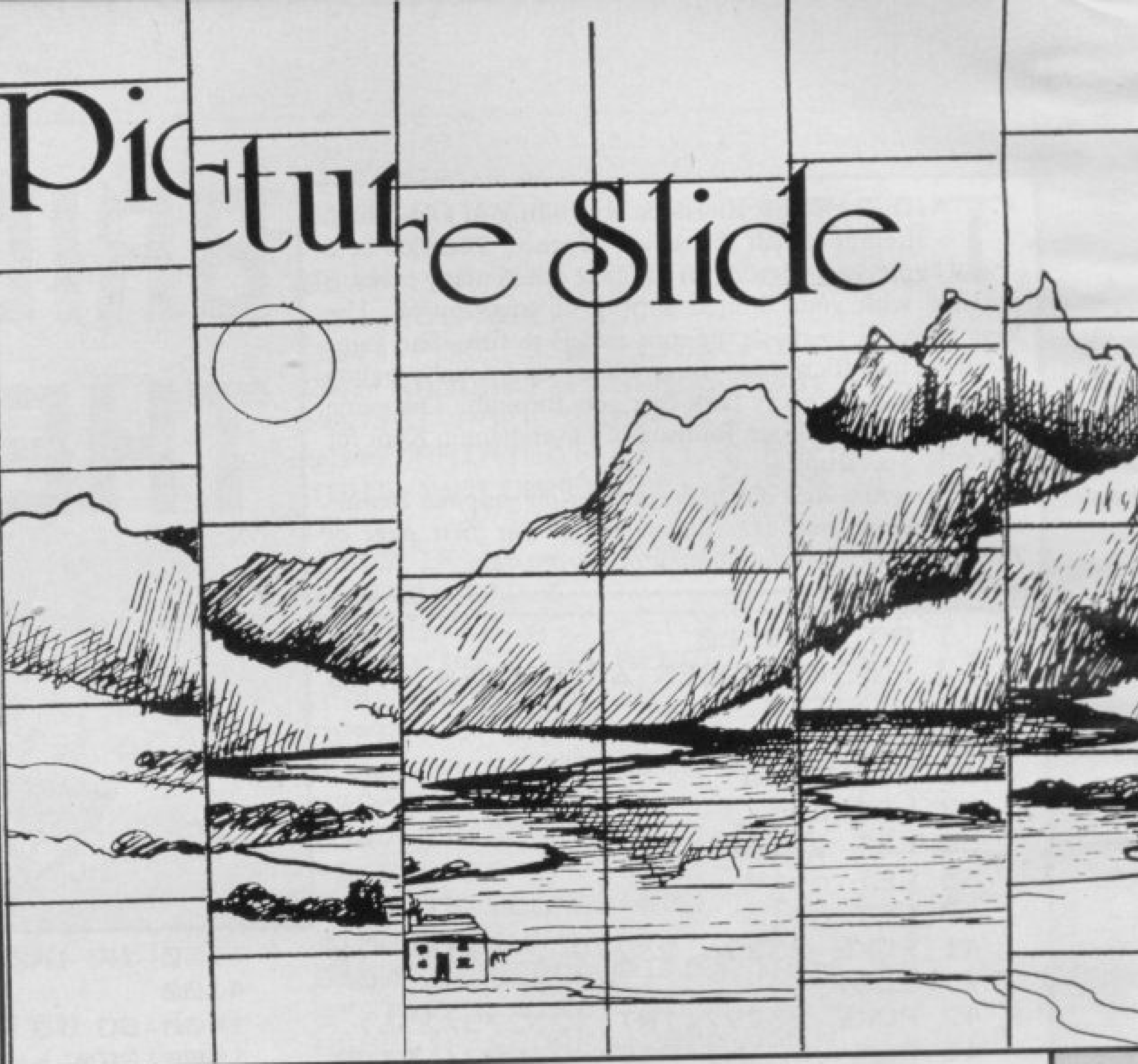
"
 350 PRINT AT I,0;"
"
```



```
 355 NEXT I
 360 FOR I=22 TO 2 STEP -1
 370 PRINT AT I,0;K$+"
                                "
 380 NEXT I
 400 POKE 16418,2
 410 IF USR 16729=1 THEN GOTO 50
0
 420 PRINT ,," YOU DID NOT MANAG
E TO BEAT THE          OLD HIGH SC
ORE OF"
 430 PRINT ,,TAB 5;PEEK 16520+PE
EK 16521*256;TAB 10;" SCORED BY
";A$
 440 PRINT ,," PRESS ANY KEY TO 
GET THE MENU."
 450 IF INKEY$="" THEN GOTO 450
 460 GOTO 1085
 500 PRINT ,," YOU HAVE JUST SCO
RE A NEW HIGH          ENTER YOUR
 NAME",,TAB 9;"MAX 7 LETTERS"
 510 INPUT A$( TO 7)
 520 GOTO 430
 530 CLS
 540 PRINT TAB 4;"  MA
RS  "
 550 PRINT TAB 7;"  MA
N  "
 560 PRINT "
          ",,TAB 9;"INSTRUCTION
S",TAB 9;"            ",," YOU HA
VE BEEN TELEPORTED DOWN   FROM
YOUR SPACESHIP IN ORBIT  AROUND
MARS TO THE DEEP MARTIAN CAVES,W
HAT YOU HAVE TO DO IS TO     COL
LECT AS MANY VALUABLE     MARTIA
N GOLD NUGGETS AS YOU CAN"
 570 PRINT "    BEFORE YOU RUN OU
T OF AIR.",,TAB 10;"PRESS(N/L)"
 580 IF INKEY$<>CHR$ 118 THEN GO
TO 580
 590 CLS
 600 PRINT "  EACH NUGGET IS WOR
TH 4 POINTS AND IF YOU CAN ESCAP
E TO THE TOP  LEVEL YOU GET A BO
NUS OF 256      POINTS.JUST ONE M
ORE ITEM.  THERE IS A RATHER NA
STY MARTAIN MONSTER THAT LIVES O
N VHE UPPER    LEVELS.THIS MONSTE
R EATS THE   NUGGETS SO YOU MUST
 TRY TO GET   THEM BEFORE THE MO
NSTER DOES."
 610 PRINT ,,TAB 9;"KEYS TO PRES
S",TAB 9;"            ",,TAB 11
;"5:LEFT",TAB 11;"6:DOWN",TAB 11
;"7:UP",TAB 11;"8:RIGHT"
 615 PRINT ,,TAB 10;"PRESS(N/L)"
 616 IF INKEY$<>CHR$ 118 THEN GO
TO 616
 617 CLS
 620 PRINT ,,TAB 12;"FIGERS",TAB
12;"       ",,TAB 11;"+:YOU",TAB
11;" :MONSTER",TAB 11;".:NUGGET
S",TAB 11;" :WALL",TAB 11;" :TOP
LEVEL"
 630 GOTO 440
 640 POKE 16418,0
 645 FOR I=0 TO 15
 650 PRINT AT 23,0;"      YOU HA
VE BEEN CAUGHT      "
 660 PRINT AT 23,0;"      YOU HA
VE BEEN CAUGHT      "
 670 NEXT I
 680 LET K$="      YOU HAVE BEEN
CAUGHT      "
 690 GOTO 345
 700 POKE 16520,0
 710 POKE 16521,0
 720 LET A$="NOBODY."
 730 GOTO 1085
 800 CLS
 810 PRINT AT 11,0;" PLEASE STAR
T THE TAPE RECORDER            R
ECORDING"
 8.. FOR I=0 TO 15
 8.. NEXT I
 8.. PRINT ,," WAIT FOR THE BLA
 ..E TO MOVE                     ON"
 845 FOR I=0 TO 15
 848 NEXT I
 850 PRINT ,,TAB 3;"AND PRESS A
KEY WHEN READY"
 855 PRINT ,,TAB 2;"(TO RELOAD L
OAD AS""MARSMAN"")"
 860 IF INKEY$="" THEN GOTO 860
 870 CLS
 880 SAVE "MARSMAN"
 890 GOTO 1085
1000 POKE 16517,PEEK 16517+1
1010 PRINT AT 0,10;(PEEK 16516+P
EEK 16517*256)
1020 POKE 16418,0
1030 FOR I=0 TO 15
1040 PRINT AT 23,0;"   YOU HAVE
ESCAPED THE CAVES   "
1050 PRINT AT 23,0;"   YOU HAVE
ESCAPED THE CAVES   "
1060 NEXT I
1070 LET K$="   YOU HAVE ESCAPED
 THE CAVES   "
1080 GOSUB 345
1085 CLS
1090 PRINT TAB 7;"             ",TAB 7;"             ",TAB
7;"             "
1100 PRINT TAB 7;"
"
1110 PRINT ,,TAB 7;"1 THE GAME",
,TAB 7;"2 INSTRUCTIONS",,TAB 7
;"3 HIGH SCORE RESET",,TAB 7;"4
 PROG SAVE"
1115 PRINT ,," PRESS THE KEY OF
THE NUMBER OF          YOUR CHO
ICE"

1120 IF INKEY$="1" THEN GOTO 5
1130 IF INKEY$="2" THEN GOTO 530
1140 IF INKEY$="3" THEN GOTO 700
1150 IF INKEY$="4" THEN GOTO 800
1160 GOTO 1120
1165 FAST
1170 LET L$=    "80007801C6020000
"
1180 LET L$=L$+"007CB8C07DB9C9ED
"
1190 LET L$=L$+"4B8640210000CD8B
"
1200 LET L$=L$+"40281C2A0C401119
"
1210 LET L$=L$+"0019220E40ED4B86
"
1220 LET L$=L$+"400B0B000000ED43
"
1230 LET L$=L$+"8640CD980A182801
"
1240 LET L$=L$+"0000C92A0C401B19
"
1250 LET L$=L$+"18432A0C40131918
"
1260 LET L$=L$+"3C2A0C4006211310
"
1270 LET L$=L$+"FD1918312A0C4006
"
1280 LET L$=L$+"211B10FD1918262A
"
1290 LET L$=L$+"0C40ED5B8240193A
"
1300 LET L$=L$+"8A407701FEF7ED78
"
1310 LET L$=L$+"FE6F28C701FEEFED
"
1320 LET L$=L$+"78FE6F28CCFE7728
"
1330 LET L$=L$+"D3FE7B28BD7EFE80
"
1340 LET L$=L$+"282FFEB2282B326A
"
1350 LET L$=L$+"40ED5382403617FE
"
1360 LET L$=L$+"1BC0ED4B84400303
"
1370 LET L$=L$+"0303ED4384402A0C
"
1380 LET L$=L$+"40110B0019220E40
"
1390 LET L$=L$+"CD980A3E00328A40
"
1400 LET L$=L$+"C92A0C40ED5B8240
"
1410 LET L$=L$+"193617C90142002A
"
1420 LET L$=L$+"8240CD8B40380401
"
1430 LET L$=L$+"C800C901E803C9ED
"
1440 LET L$=L$+"4B84402A8640CD8B
"
1450 LET L$=L$+"403804010000C9ED
"
1460 LET L$=L$+"438840010100C9"
1465 LET TOT=0
1470 FOR I=0 TO 238
1480 LET A=((CODE (L$(I*2+1))-28
)*16+CODE L$(I*2+2)-28)
1490 POKE 16514+I,A
1495 LET TOT=TOT+A
1500 NEXT I
1505 SLOW
1510 IF TOT=20521 THEN GOTO 700
1520 PRINT "SORRY.  THERE IS A M
ISTAKE IN","LINES 1170 TO 1460,
 PLEASE","CHECK YOUR LISTINGS."
```

Picture Slide



A VARIATION on those sliding block puzzles you find in Christmas stockings, **Picture Slide** uses an impressive machine-code routine to swap areas of the screen display. Written by Pete Cooke of Leicester for the 16K Spectrum, it uses a simple picture located at lines 8210–8240. If you want you can adapt the program at those lines to draw your own picture, or even use a professional draw program to create a picture.

The program uses our special graphics abbreviations so please read the section at the beginning of Program Printout for instructions on how to enter these.

```
 10 CLEAR 30999
 20 DEF FN A(X)=8*(X+1)
 30 IF PEEK 31000<>33 THEN  GO
SUB 9500
 40 POKE 23658,0
100 GO SUB 8000: REM DRAW SCREE
N
105 PAPER 7
110 GO SUB 2000: REM SHUFFLE
120 LET move=1
1000 PRINT #1;AT 0,0; PAPER 7;"P
RESS ARROWS TO MOVE . MOVE ";MOV
E;AT 1,0;"(5*sp)*** Press q to q
uit ***"
1020 LET Z$=INKEY$: IF Z$<>"q" A
ND (z$<"5" OR z$>"8") THEN  GO T
O 1020
1030 IF z$="q" THEN  GO TO 1100
1040 GO SUB 1500: LET move=move+
1: GO TO 1000
1100 INPUT "": PRINT #1;AT 0,0;
PAPER 6;"**** Stopped ****(2*sp)
Press ENTER(2*sp)to try again, R
 to reshuffle.(3*sp)";
1110 IF INKEY$<>"" THEN  GO TO 1
110
1120 LET z$=INKEY$: IF z$<>CHR$
13 AND z$<>"r" THEN  GO TO 1120
1130 IF z$="r" THEN  GO SUB 2000
: GO TO 1000
1140 RUN
1500 IF z$="8" AND x-(y=4)>3 THE
N  BEEP .1,12: RETURN : REM X=5
Y=4
1510 IF z$=("5" AND x=0) OR (z$=
"7" AND y=0) OR (z$="6" AND y=4)
 THEN  BEEP .1,12: RETURN
1520 IF x=5 AND z$<>"5" THEN  BE
EP .1,12: RETURN
1530 LET a=x-(z$="5")+(z$="8"):
LET b=y-(z$="7")+(z$="6")
1540 GO SUB 3000: RETURN
1999 STOP
2000 INPUT "How many swops (0 TO
 200) ";swops: IF swops<0 OR swo
ps>200 THEN  GO TO 2000
2010 FOR n=1 TO 6: LET z$="55577
7"(n): GO SUB 1500: NEXT n
2020 FOR n=1 TO swops: LET z$="5
678"(INT (1+RND*4)): GO SUB 1500
: NEXT n
2030 RETURN
3000 REM *** SWOP X,Y WITH A,B *
**
3010 POKE 31001,32*A+8: POKE 310
02,32*B+8: POKE 31004,32*X+8: PO
KE 31005,32*Y+8
3020 LET X=A: LET Y=B: REM  EMPT
Y SQUARE
3030 LET V=USR 31000
3040 RETURN
8000 REM ** SET UP THE SCREEN **
8010 PAPER 7: INK 0: BORDER 7: C
LS : PRINT AT 0,0;"(ig4,20*g3,g7
)"
8020 FOR N=1 TO 15: PRINT AT N,0
;"(ig5)";TAB 21;"(g5)": NEXT N
8030 PRINT AT 16,0;"(ig5)";TAB 2
1;"(g1,3*g3,g7)"
8040 FOR N=17 TO 20: PRINT AT N,
0;"(ig5)";TAB 21;"(4*sp,g5)": NE
XT N
8090 PRINT "(ig1,24*ig3,ig2)"
8100 LET X=5: LET Y=4
8110 PRINT AT 0,23; PAPER 1; INK
 7; BRIGHT 1;"(9*sp)";AT 1,23;"
Sliding ";AT 2,23;" Block(3*sp)"
;AT 3,23;" Puzzle(2*sp)";AT 4,23
;"(9*sp)"
8120 PRINT AT 6,23; PAPER 6;" P.
Cooke ";AT 7,23;" May 84(2*sp)"
8130 REM
8200 REM

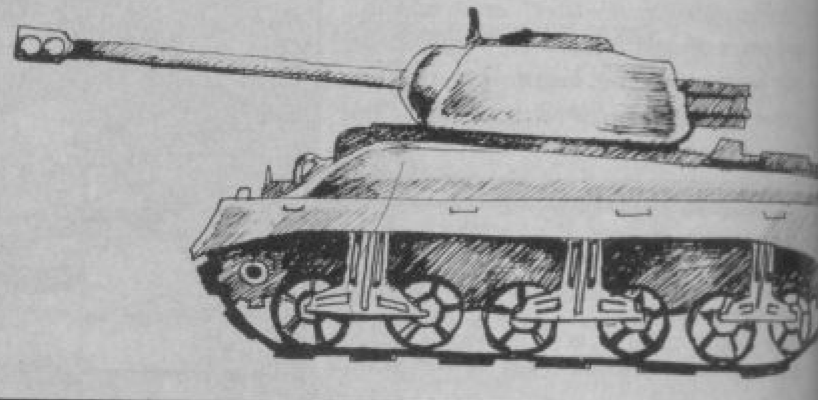
   ** PUT YOUR DESIGN HERE **

8210 FOR n=1 TO 20: PRINT AT n,1
; PAPER (6-(n<6));"(20*sp)": NEX
T n
8220 INK 1: FOR n=20 TO 80 STEP
2: PLOT n,20: DRAW 0,n: NEXT n
8230 INK 2: FOR n=20 TO 80 STEP
2: PLOT n+76,20: DRAW 0,100-n: N
EXT n
8240 INK 8: FOR n=10 TO 30: CIRC
LE 88,90+n,n: NEXT n
8250 PAPER 4: INK 0: PRINT AT 18
,2;"(2*sp)Puzzle this out ";AT 1
9,2;"(3*sp)If you can !!(2*sp)"
8260 INK 3: FOR n=40 TO 136 STEP
 96: FOR m=-15 TO 15: PLOT n,90:
 DRAW m,55: NEXT m: NEXT n
8270 INK 2: FOR n=40 TO 136 STEP
 96: FOR m=-15 TO 15: PLOT n,70:
 DRAW m,15: NEXT m: NEXT n
8280 PRINT AT 1,3; PAPER 7; INK
1;"OOOOOOOOOOOOOOOO";AT 1,3; OVE
R 1;"(4*ig3)/\/\/\/\(4*ig3)"
8290 PRINT AT 2,3; PAPER 2; INK
7;"<><><><><><><>"
8300 RETURN
8900 STOP
9000 DATA 33,168,136,1,136,136,3
4,246,121,237
9010 DATA 67,248,121,34,250,121,
237,67,252,121
9020 DATA 62,32,50,254,121,237,7
5,250,121,205
9030 DATA 172,121,4,237,67,250,1
21,229,237,75
9040 DATA 252,121,205,172,121,4,
237,67,252,121
9050 DATA 209,6,4,26,119,62,0,18
,35,19
9060 DATA 16,247,58,254,121,214,
1,50,254,121
9070 DATA 32,209,237,75,246,121,
237,67,250,121
9080 DATA 237,75,248,121,237,67,
252,121,62,4
9090 DATA 50,254,121,237,75,250,
121,205,220,121
9100 DATA 120,198,8,71,237,67,25
0,121,229,237
9110 DATA 75,252,121,205,220,121
,120,198,8,71
9120 DATA 237,67,252,121,209,6,4
,26,119,58
9130 DATA 141,92,18,19,35,16,246
,58,254,121
9140 DATA 214,1,50,254,121,32,20
2,201,62,191
9150 DATA 144,216,120,245,230,56
,38,16,111,41
9160 DATA 41,241,245,230,192,203
,63,203,63,203
9170 DATA 63,132,103,241,230,7,1
32,103,121,230
9180 DATA 7,87,121,203,63,203,63
,203,63,133
9190 DATA 111,124,206,0,103,201,
120,230,248,111
9200 DATA 38,22,41,41,121,230,7,
87,121,203
9210 DATA 63,203,63,203,63,133,1
11,62,0,132
9220 DATA 103,201
9500 CLS : PRINT AT 5,3;"Poking
in machine code.";AT 7,9;"Please
 wait."
9510 LET total=0: RESTORE 9000:
FOR n=31000 TO 31221: READ a: LE
T total=total+a: POKE n,a
9520 NEXT n
9530 IF total<>29212 THEN  PRINT
 ''"Data error ... do not RUN":
STOP
9540 RETURN
```

BRIDGE ON THE RHINE

THE PANZER divisions are rolling in a last-ditch attempt to halt the Allied advance. Your job is to guard a bridge and try to take out as many tanks as possible with your limited supply of ammunition. Use keys Z and X to move the gun and P to fire. The game increases in difficulty as you progress, and penalty points are deducted for every tank that gets through. The game was written by William Johnson of Faversham in Kent for the 48K Spectrum.

The program uses our abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.



```
   1 GO TO 9000
   2 INK 0: PAPER 6: BORDER 6: B
RIGHT 1: CLS
  10 LET x=29
  15 LET cx=0
  20 LET a=1
  30 LET y=160
  35 LET o=10
  40 LET g=15
  41 POKE 23296,23279-256*INT (2
3277/256)
  42 POKE 23297,INT (23275/256)
  43 REM  PRINT PEEK 23297: STOP

  50 LET score=0
  55 LET speed=1
  60 LET amo=20
  65 LET difficulty=1.8
  70 LET s=1
  75 POKE 23658,0
  80 GO SUB 7000
  85 GO SUB 8000: GO SUB 8020
  90 REM **END OF VARIABLES**
 100 GO TO 1000
 500 REM ****TANK MOVE********
 505 IF x<1 THEN  PRINT AT 5,0;"
(3*sp)": LET score=score-100: GO
 SUB 8020: GO SUB 6100: LET x=29
: RETURN
 670 IF s=1 THEN  GO TO 2100
 675 IF s=0 THEN  GO TO 2120
 680 RETURN
 900 REM **END OF TANK MOVE***
1000 REM **MAIN LOOP********
1010 IF INT (RND*o)=1 THEN  LET
speed=0
1100 IF speed=1 THEN  GO SUB 500
1110 IF INT (RND*5)=1 THEN  LET
speed=1
1121 GO SUB 5000
1125 PLOT  INVERSE 1;g*8,y+diffi
culty
1130 IF y<160 THEN  GO SUB 3090
1131 IF INKEY$="p" THEN  GO TO 3
000
1145 IF INKEY$="z" THEN  GO SUB
4000
1150 IF INKEY$="x" THEN  GO SUB
4100
1400 GO TO 1000
1500 REM **END OF MAIN LOOP*****
*
2090 REM ***TANK PRINT*******
2100 PRINT AT 5,x;"AB(sp)"
2110 LET s=0: RETURN
2120 PRINT AT 5,x-1; "CDE(sp)"
2130 LET x=x-1: LET s=1: RETURN
2160 REM ****END OF TANK PRINT:
3000 REM ***BOM DROP**********
3010 PRINT AT 15,g;"G"
3020 PRINT AT 14,g;"H"
3030 RANDOMIZE USR 33000: BORDER
 6: LET amo=amo-1: GO SUB 8000
3040 IF amo<0 THEN  GO TO 8500
3080 PRINT AT 15,g; PAPER 6;"(sp
)";AT 14,g; PAPER 6;"(sp)"
3110 PLOT g*8,y
3120 LET y=y-difficulty
3130 GO TO 1170
4000 IF g<=0 THEN  RETURN
4001 LET g=g-1
4005 LET af=(PEEK 23296)-1
4010 POKE 23296,af
4030 RANDOMIZE USR 32000: PRINT
AT 16,g;"F"
4040 RETURN
4050 POKE 23295,63
4100 IF g>=31 THEN  RETURN
4105 POKE 23296,(PEEK 23296)+1
4110 LET g=g+1
4120 RANDOMIZE USR 32000: PRINT
AT 16,g;"F"
4500 RETURN
5000 REM ***HIT?***********
5050 IF y<=128 THEN  LET y=160:
```

```
GO SUB 5240
5060 IF y<=134 THEN  GO TO 5100
5070 RETURN
5100 IF g=X OR g=x+1 OR g=x+2 TH
EN  GO TO 5200
5110 RETURN
5210 IF g=x THEN  LET score=scor
e+100
5220 IF g=x+2 THEN  LET score=sc
ore+50: LET amo=amo+2
5230 IF g=x+1 THEN  LET score=sc
ore+75
5231 GO SUB 8020
5232 PRINT AT 5,0;"(31*sp)"
5233 GO SUB 5240
5234 GO TO 5290
5245 PRINT AT 5,g; INK 2;"G"
5247 PRINT AT 4,g; INK 2;"H"
5250 BEEP .1,-50
5270 PRINT AT 5,g;"(sp)";AT 4,g;
"(sp)"
5280 RETURN
5290 LET x=29: LET y=160
5300 IF score>=300 THEN  LET amo
=amo+1
5310 IF score>=1000 THEN  LET o=
15: LET difficulty=difficulty+1
5320 RANDOMIZE USR 33023
5330 RANDOMIZE USR 33023
6000 RETURN
6100 LET cx=cx+1: PRINT AT 7,0;c
x: RETURN
7100 PRINT AT 6,0; INK 4;"(6*ig8
,19*#,7*ig8)"
7110 PRINT AT 7,0; INK 4;"(6*ig8
,ig1)/(2*sp,g5,9*sp,g5,2*sp)\(ig
2,7*ig8)"
7130 PRINT AT 8,0; INK 4;"(7*ig8
,ig1,2*sp,g5,9*sp,g5,2*sp,ig2,8*
ig8)"
7140 PRINT AT 9,0; INK 4;"(8*ig8
,ig1,sp,g5)"; INK 5;"(sp,7*_,sp)
"; INK 4;"(g5,sp,ig2,9*ig8)"
7200 PLOT 48,127: DRAW 151,0
7210 PLOT 48,120: DRAW 151,0
7220 PLOT 0,167: DRAW 255,0
7300 PRINT AT 0,0; PAPER 3;"(32*
sp)"
7400 RANDOMIZE USR 32000
7410 PRINT AT 16,g;"F"
7420 POKE 23295,63
7900 RETURN
8000 PRINT AT 0,13; PAPER 3; BRI
GHT 1;;"(3*sp)AMMUNITION:(sp)";a
mo;"(sp)"
8010 RETURN
8020 PRINT AT 0,2; PAPER 3;"SCOR
E=";score;"  "
8030 RETURN
8510 POKE 33006,20: POKE 33009,1
8
8520 PRINT AT 10,11; FLASH 1; IN
K 2;"GAME OVER"
8530 PRINT AT 0,26; FLASH 1; INK
 2;"EMPTY"
8540 FOR A=1 TO 3: RANDOMIZE USR
 33000: NEXT a
8541 POKE 33019,13: POKE 33004,1
00: RANDOMIZE USR 33000: POKE 33
004,3: POKE 33019,12
8542 PRINT AT 10,11; PAPER 3; BR
IGHT 1;"COMMENT:"; PAPER 6;"(2*s
p)"
8543 IF score>=-2000 THEN  LET A
$="VEGATABLE"
8544 IF SCORE>=-1000 THEN  LET A
$="GO BACK TO SLEEP"
8545 IF SCORE>=0 THEN  LET A$="L
OSER"
8546 IF SCORE>=100 THEN  LET A$=
"ZOMBIE"
8547 IF SCORE>=300 THEN  LET A$=
"BEGINNER"
8549 IF SCORE>=800 THEN  LET A$=
"IMPRESSIVE"
8550 IF SCORE>=1000 THEN  LET A$
="STREET WISE"
8555 IF SCORE>=2000 THEN  LET A$
="GENERAL PRO"
8557 IF SCORE>=5000 THEN  LET A$
="WHIZZ KID"
8558 PRINT AT 12,11; PAPER 3; FL
ASH 1;A$
8560 POKE 33006,2: POKE 33009,24
8570 PRINT AT 0,0;"(5*sp)PRESS A
NY KEY TO PLAY(6*sp)"
8580 IF INKEY$<>"" THEN  RUN 2
8590 GO TO 8580
9000 FOR z=0 TO 38: READ a: POKE
 32000+z,a: NEXT z
9030 DATA 33,0,90,6,255,62,63,11
9,35,16,252,42,0,91,62,0,119,1,3
2,0,237,66,119,237,66,119,237,66
,119,237,66,119,237,66,119,237,6
6,119,201
9050 FOR a=0 TO 63: READ z: POKE
 65368+a,z: NEXT a
9060 DATA 0,255,7,1,127,255,170,
85,112,254,254,248,254,255,170,8
4,0,15,0,0,7,15,5,2,7,255,255,63
,255,255,85,170,0,192,192,0,192,
224,64,128,255,165,165,165,165,1
65,165,126,149,215,90,93,107,50,
46,60,129,36,1,138,36,38,88,42
9070 FOR A=0 TO 48: READ X: POKE
 33000+A,X: NEXT A
9080 DATA 33,0,0,14,3,22,2,126,2
30,24,211,254,65,16,254,35,21,32
,244,12,32,239,201,33,0,64,126,7
,119,21,35,124,254,88,32,246,33,
0,64,126,15,119,35,124,254,88,32
,247,201
9999 GO TO 2
```

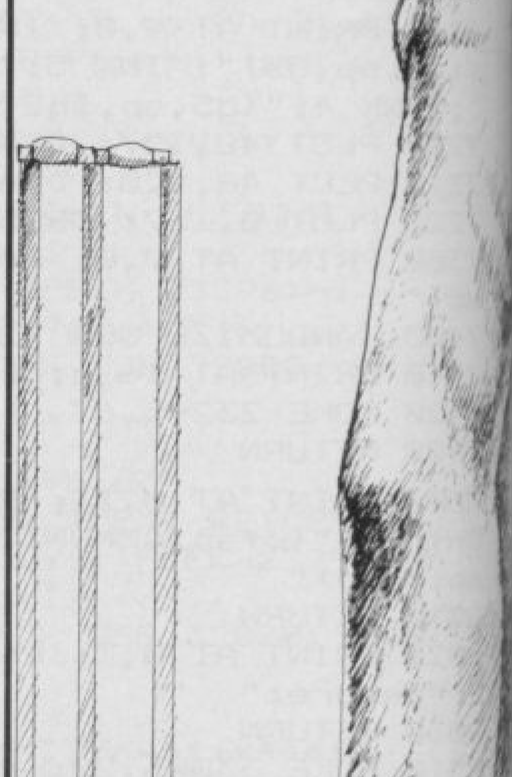


CRICKET

GET SOME practice in the nets with **Cricket** for the 16K ZX-81. You decide how many bowls you want to receive and then press 0 to bowl and D to strike the ball. The computer will then show you how many runs you have scored. The full score is given at the end of the game or when you are bowled out. Cricket was written by Mark White of Redditch in Worcestershire.



```
   2 LET BA=0
   3 GOSUB 5000
   4 LET R=0
   5 CLS
   6 LET BA=BA+1
   7 IF BA>BO THEN GOTO 6000
  10 PRINT AT 15,0;"  ";AT 16,0
0;"  ";AT 17,
0;"  ";AT 18,
  20 PRINT "
"
  30 PRINT AT 17,29;" ";AT 18,2
9;" "
  40 PRINT AT 15,26;"  ";AT 16,2
6;"  ";AT 17,
26;"  ";AT 18,
26;"  "
  45 PRINT AT 21,0;" RUNS FOR ";
D$;"=";R
  50 GOSUB 9000
4000 REM **HIT BALL**
4003 LET K=INT (RND*2)
4005 PRINT AT 15,25;
     " ";AT 16,26;" "
4010 FOR F=25 TO 0 STEP -1
4020 IF K=0 THEN PRINT AT A,F;".
";AT A,F;" "
4022 IF K=1 THEN PRINT AT 18,F;"
.";AT 18,F;" "
4025 LET A=A-.3
4026 IF K=1 AND F=3 THEN GOTO 43
00
4030 NEXT F
4035 IF K=1 THEN GOTO 4300
4040 CLS
4050 FOR F=0 TO 21
4060 PRINT "
"
4070 NEXT F
4072 FOR F=8 TO 12
4073 PRINT AT F,8;"
"
4074 NEXT F
4075 PRINT AT 21,0;" RUNS FOR ";
D$(1);"=";R
4080 PRINT AT 10,10;" ";AT 10,20
;"  "
4090 LET X=9
4100 LET Y=10
4105 FOR F=0 TO 10
4110 PRINT AT X,Y;".";AT X,Y;" "
4115 NEXT F
4120 LET Y=Y-RND*9
4130 LET L=INT (RND*2)
4140 IF L=1 THEN LET X=X+RND*10
4150 IF L=2 THEN LET X=X-RND*10
4160 PRINT AT X,Y;"."
4170 IF X>15 OR X<5 THEN LET R=R
+4
4180 IF Y<4 THEN LET R=R+4
4190 IF X<15 OR X>5 THEN LET R=R
+1
4200 IF X=21 OR X=0 THEN LET R=R
+6
4210 PRINT AT 21,0;"RUNS FOR ";D
$;"=";R
4220 FOR F=1 TO 100
4230 NEXT F
4240 GOTO 5
4300 PRINT AT 15,0;"  ";AT 16,0
;"  ";AT 17,
0;"  ";AT 18
,0;"  "
4310 FOR F=0 TO 50
4320 NEXT F
4330 GOTO 5
5000 CLS
5001 PRINT AT 0,5;"ENTER BATTERS
 TEAMS"
5005 INPUT D$
5020 CLS
5030 PRINT AT 0,5;"ENTER NUMBER
OF BOWLS"
5040 INPUT BO
5050 IF BO<1 OR BO>=30 THEN GOTO
 5040
5100 RETURN
6000 CLS
6010 PRINT AT 5,5;"TOTAL RUNS FO
R ";D$;"=";R
6020 LET P=R/B
6030 PRINT AT 7,0;" PERCENTAGE O
F RUNS PER BALL=
 ";P;" %"
7999 STOP
8000 LET H=INT (RND*4)
8010 IF H=1 OR H=4 THEN GOTO 950
0
8020 GOTO 4000
8500 LET H=INT (RND*4)
8510 IF H=1 OR H=4 THEN GOTO 950
0
9000 REM **BALL**
9010 LET A=15
9020 LET B=2
9025 IF INKEY$="" THEN GOTO 9025
9040 PRINT AT 15,0;"   ";AT 16,0
;"  "
9045 PRINT AT A,B;".";AT A,B;" "
9050 LET B=B+1
9060 LET A=A+RND*.5
9070 IF A>=18 THEN GOTO 9110
9075 IF INKEY$="D" AND B>=22 THE
N GOTO 8000
9090 IF B>=26 THEN GOTO 9500
9100 GOTO 9045
9110 LET A=A-.4
9120 LET B=B+1
9130 PRINT AT A,B;".";AT A,B;" "
9140 IF A<=16 THEN GOTO 9045
9150 IF INKEY$="5" AND B>=22 THE
N GOTO 8500
9170 IF B>=26 THEN GOTO 9500
9200 GOTO 9110
9500 REM **MISS BALL**
9510 FOR F=1 TO 20
9520 PRINT AT 17,30;"  ";AT 17,3
0;"  "
9530 NEXT F
9540 PRINT AT 10,10;"""OWZAT"""
9545 PRINT AT 21,0;"
"
9550 PRINT AT 21,0;"  ANOTHER
BAT?      RUNS=";R
9560 IF INKEY$="Y" THEN RUN
9570 IF INKEY$="N" THEN STOP
9580 GOTO 9550
9980 SAVE "CRICKET"
9990 RUN
```



Wally meets the Things



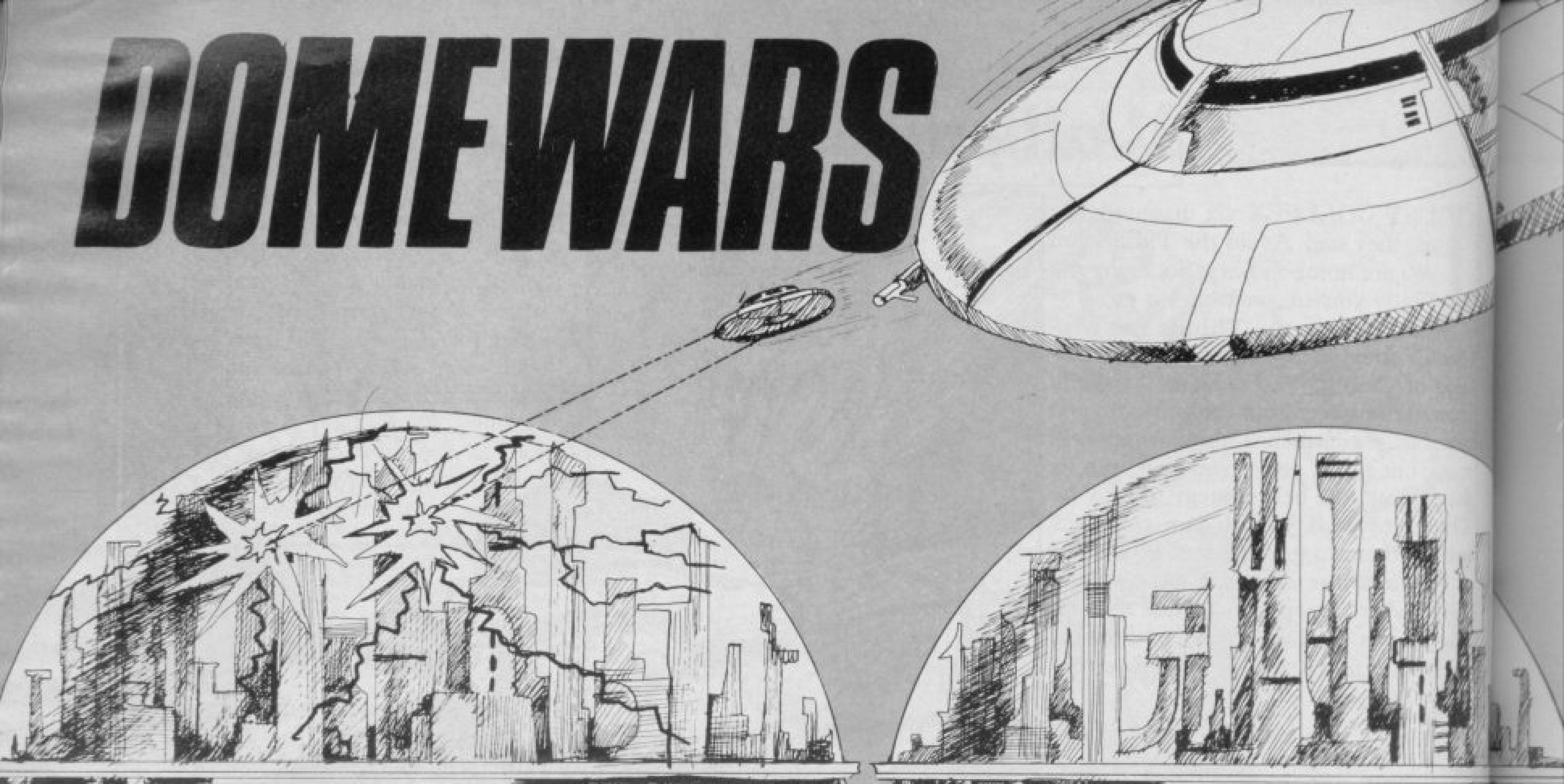
JUST COLLECT six diamonds for us, they said. Avoid the Things and you are home and dry. So, being the Wally you are, you have a go.

Wally Meets the Things was written for the 16k Spectrum by P Mansfield of Cardiff. You must move Wally around the screen, but each column and row has a guardian Thing, which will move out to get you if you step onto its patch. Find the best strategy to lure the Things towards you so you can duck behind them to get the diamonds.

The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

```
1 FOR i=0 TO 23
2 READ j
3 POKE USR "a"+i,j
4 NEXT i
5 DATA 126,219,255,195,126,66
,66,129,60,90,153,231,231,153,90
,60,24,24,8,126,8,24,36,66
6 PRINT FLASH 1; INK 4;AT 0,
5;"GET READY"
7 PRINT PAPER 1; INK 7;"USE
CURSOR KEYS TO MOVE MAN -(3*sp)W
ALLY HAS TO AVOID THE THINGYS(2*
sp)AND COLLECT(2*sp)SIX DIAMONDS
TO WIN -THE THINGYS ARE DEADLY
AND SO(2*sp)ARE THE RED AND BLUE
BORDERS(3*sp)"
8 BORDER 3
9 PAUSE 200
10 CLS
11 PLOT 0,7: DRAW 248,0: DRAW
0,167
15 PAPER 7: INK 0
20 DIM a(20)
25 DIM b(30)
35 LET w$="(sp)": LET k=0: LET
t=0
40 LET x=1
50 FOR y=1 TO 30
60 PRINT INK 2;AT x,y;"A"
70 LET b(y)=1
80 NEXT y
90 LET y=1
100 FOR x=1 TO 20
110 PRINT INK 1;AT x,y;"A"
120 LET a(x)=1
130 NEXT x
135 LET c=20: LET d=30
140 PRINT INK 3;AT c,d;"C"
150 PRINT INK 1;AT 0,0;"(31*g3
)"
155 PRINT INK 2;AT 0,0;"(ig4)"
160 FOR p=1 TO 20
170 PRINT INK 2;AT p,0;"(ig5)"
175 NEXT p
176 PRINT PAPER 6; INK 2;AT 0
,1;"B"
177 PRINT PAPER 6; INK 2;AT 0
,15;"B"
178 PRINT PAPER 6; INK 2;AT 0
,30;"B"
179 PRINT PAPER 6; INK 2;AT 6
,0;"B"
180 PRINT PAPER 6; INK 2;AT 1
3,0;"B"
181 PRINT PAPER 6; INK 2;AT 2
0,0;"B"
183 FOR u=1 TO 5
185 BEEP .05,20: BEEP .05,22: B
EEP .05,25: BEEP .05,30
187 NEXT u
190 REM move man
200 GO SUB 300
210 REM move red down
213 IF d=0 THEN GO TO 225
215 IF a(b(d))=d THEN LET w$="
A": LET k=1
220 GO SUB 400
223 LET w$="(sp)": LET k=0
225 REM move man
230 GO SUB 300
235 REM move blue across
236 IF c=0 THEN GO TO 190
237 IF b(a(c))=c THEN LET w$="
A": LET k=2
240 GO SUB 420
245 LET w$="(sp)": LET k=0
250 GO TO 190
290 REM move man
300 PRINT AT c,d;"(sp)"
310 LET d=d-(INKEY$="5" AND d>0
)+(INKEY$="8" AND d<30)
320 LET c=c-(INKEY$="7" AND c>0
)+(INKEY$="6" AND c<20)
330 IF ATTR (c,d)=57 OR ATTR (c
,d)=58 THEN GO TO 1000
335 IF ATTR (c,d)=50 THEN LET
t=t+1: BEEP .05,10
340 PRINT INK 3;AT c,d;"C"
342 IF t=6 THEN GO TO 700
343 BEEP .01,-20
350 RETURN
395 REM move red down
400 IF b(d)<c THEN PRINT INK
k;AT b(d),d;w$: LET b(d)=b(d)+1:
GO SUB 500
410 IF b(d)>c THEN PRINT INK
k;AT b(d),d;w$: LET b(d)=b(d)-1:
GO SUB 500
415 RETURN
417 REM move blue across
420 IF a(c)<d THEN PRINT INK
k;AT c,a(c);w$: LET a(c)=a(c)+1:
GO SUB 600
430 IF a(c)>d THEN PRINT INK
k;AT c,a(c);w$: LET a(c)=a(c)-1:
GO SUB 600
440 RETURN
490 REM test for a hit
500 IF ATTR (b(d),d)=59 THEN P
RINT AT b(d),d;"A": GO TO 1000
510 PRINT INK 2;AT b(d),d;"A"
530 RETURN
590 REM test for a hit
600 IF ATTR (c,a(c))=59 THEN P
RINT AT c,a(c);"A": GO TO 1000
610 PRINT INK 1;AT c,a(c);"A"
630 RETURN
690 REM test for a win
700 PRINT AT 21,0;"YOU'VE WON -
Another game ? Y/N"
760 FOR v=24 TO 36
765 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
767 NEXT v
770 INPUT x$
780 IF x$="y" THEN GO TO 10
790 GO TO 1040
800 RETURN
990 REM HIT
1000 PRINT INK 3; OVER 1;AT c,d
;"C"
1010 PRINT FLASH 1;AT 21,0;"YOU
'RE DEAD-Another game Y/N"
1013 FOR v=1 TO 12
1015 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
1017 NEXT v
1020 INPUT x$
1030 IF x$="y" THEN GO TO 10
1040 STOP
```

DOMEWARS

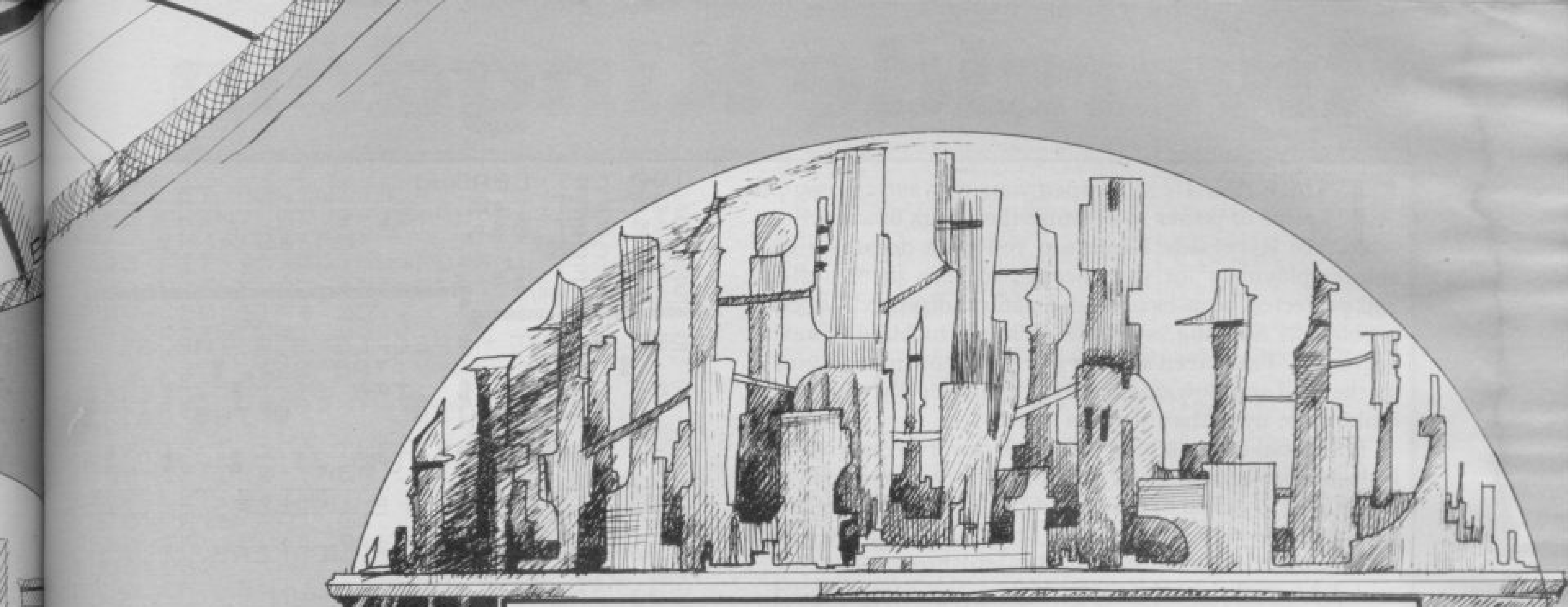


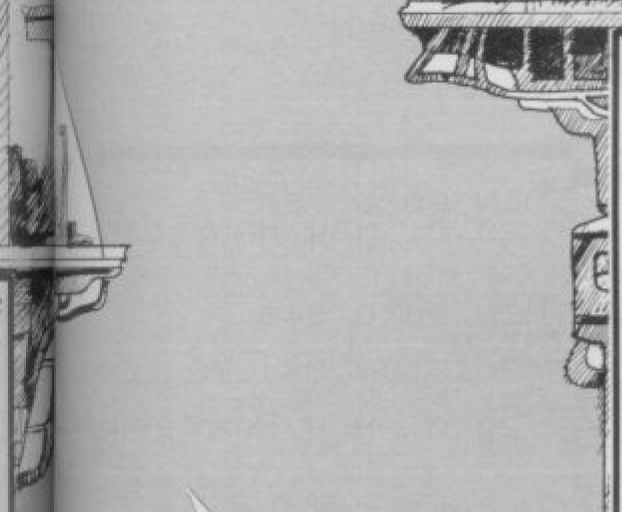
ON AN ALIEN planet a missile is about to be launched at earth. Time is short, and you must run the gauntlet of the alien defences to bomb the domes in which the evil creatures live.

Stuart Box of Thame in Oxfordshire has used an unusual graphics routine to create some spectacular scenery for **Domewars**, which runs on the 48K Spectrum.

The game uses our special abbreviations for graphics instructions, so please refer to the first page of Program Printout for advice on how to enter them before you type in the program.

```
   1 BORDER 0
   2 CLEAR 65023
   3 LET C=43
   4 LET R=C*8
   5 LET N=65367-R
   6 LET F=35-32
   7 LET D=F*8
   8 LET H=N+1-D-256
   9 LET E=H-256*INT (H/256)
  10 PAPER 0: CLS : LET T=251: P
RINT AT 1,12; INK 6; INVERSE 1;"
SAUCER";#0;"(4*sp)WRITTEN BY STU
ART BOX."
  11 INK 6: PRINT AT 3,1;"YOU MO
VE YOUR FLYING SAUCER(5*sp)AROUN
D USING THESE KEYS:-(50*sp)Q=LEF
T(26*sp)W=RIGHT(25*sp)E=DOWN(26*
sp)R=UP(28*sp)T=FIRE"
  12 PRINT AT 11,12;"P=PAUSE";AT
 12,0;"(PRESS ANOTHER KEY TO CON
TINUE)";AT 13,12;"M=QUIT"
  13 PRINT AT 17,1;"YOU CAN PRES
S MORE THAN ONE KEY AT A TIME WH
ICH MEANS YOU CAN(3*sp)MOVE DIAG
ONALLY."
  14 PRINT AT 21,10;"PLEASE WAIT
"
  15 LET T=INT (H/256)
  20 FOR I=N+1 TO N+R: READ A: P
OKE I,A: NEXT I
  35 DATA 0,0,0,0,0,0,0,0
  36 DATA 255,255,255,129,129,25
5,255,255
  37 DATA 0,0,0,0,0,0,0,3
  38 DATA 0,0,0,0,7,56,192,0
  39 DATA 0,0,0,0,224,28,3,0
  40 DATA 0,0,0,0,0,0,0,192
  41 DATA 4,8,16,16,32,32,64,64
  42 DATA 32,33,255,255,153,153,
255,255
  43 DATA 0,0,0,224,228,252,63,6
3
  44 DATA 32,16,8,8,4,4,2,98
  45 DATA 64,79,143,153,153,159,
159,159
  46 DATA 255,255,153,153,255,22
7,227,227
  47 DATA 255,231,231,255,153,15
3,255,255
  48 DATA 0,60,66,66,98,98,98,60
  49 DATA 0,8,8,8,12,12,12,12
  50 DATA 0,124,2,2,60,96,96,62
  51 DATA 0,124,2,2,60,6,6,126
  52 DATA 0,64,96,100,100,126,4,
4
  53 DATA 0,62,64,64,60,6,6,126
  54 DATA 0,62,64,64,124,70,70,1
26
  55 DATA 0,120,8,8,12,12,12,12
  56 DATA 0,60,66,66,60,70,70,60
  57 DATA 0,60,66,66,60,6,6,126
  58 DATA 98,226,225,49,49,241,2
41,241
  59 DATA 0,0,0,0,1,2,4,8
  60 DATA 0,0,0,0,128,64,32,16
  61 DATA 8,11,11,11,8,8,8,11
  62 DATA 16,208,208,208,16,16,1
6,16
  63 DATA 11,24,40,72,143,137,14
5,251
  64 DATA 16,216,212,18,241,145,
137,223
  65 DATA 0,0,0,0,0,1,1,15
  66 DATA 0,0,0,126,129,56,56,16
  67 DATA 0,0,0,0,0,128,128,240
  68 DATA 63,109,118,63,15,0,0,0
  69 DATA 255,182,219,255,255,0,
0,0
  70 DATA 252,222,110,252,240,0,
0,0
  71 DATA 0,36,24,60,60,24,0,0
  72 DATA 255,255,126,126,60,24,
24,0
  73 DATA 24,24,24,24,24,24,24,2
4
  74 DATA 34,62,28,8,127,93,20,5
4
  75 DATA 192,240,248,255,255,24
8,240,192
  76 DATA 3,15,31,255,255,31,15,
3
  77 DATA 15,31,48,96,199,135,0,
0
 210 PRINT #0;"(2*sp)PRESS ANY K
EY TO CONTINUE"
 220 PAUSE 0
 230 CLS
 235 PRINT AT 3,11; INVERSE 1;"T
HE GAME"; INVERSE 0;AT 5,1;"YOU
HAVE TO BOMB THE DOMES(6*sp)BEFO
RE THE TIME RUNS OUT. IF(4*sp)TH
E TIME DOES RUN OUT THE(7*sp)MIS
SILE LAUNCHES AT EARTH !!!!!"
 240 PRINT AT 1,12; INVERSE 1;"S
AUCER"; INVERSE 0;AT 10,1;"TO MA
KE IT EVEN HARDER THERE(4*sp)ARE
 ALSO GUN TURRETS THAT FIRE(2*sp
)AT YOU, SO YOU HAVE TO AVOID(4*
sp)BEING SHOT."
 250 PRINT AT 16,1;"YOUR SCORE G
OES UP TEN WHEN YOU HIT A DOME."
 260 PRINT #0;"(2*sp)PRESS ANY K
EY TO CONTINUE"
 300 PAUSE 0: CLS
 301 PRINT AT 1,12; INVERSE 1;"W
ARNING";AT 3,1; INVERSE 0;"DO NO
T BREAK INTO THIS PROGRAM(2*sp)U
SING THE BREAK KEYS. INSTEAD(3*s
p)PRESS 0."
 302 PRINT #0;"(4*sp)PRESS ANY K
```





```
EY TO PLAY."
 303 PAUSE 0
 304 LET S=0
 305 CLS : POKE 23606,232
 310 POKE 23607,252
 320 BEEP .01,0: FOR Z=0 TO 8: P
RINT AT Z,0;"$$$$$$$$$$$$$$$$K";A
T Z,25;"L$$$$$$": NEXT Z: POKE 2
3606,0: POKE 23607,60: PRINT AT
3,2;"SCORE="
 321 PRINT AT 5,2;"TIME=": POKE
23606,232: POKE 23607,252
 325 PRINT AT 21,0;"$$$$$$$$$$$$
$$$$$$$$$$$$$$$$$$$$": FOR Z=0 T
O 20: PRINT AT Z,0;"$";AT Z,31;"
$": NEXT Z
 326 PRINT AT 17,30;"L": FOR Z=1
6 TO 20: PRINT AT Z,16;"$": NEXT
 Z: PRINT AT 17,17;"K";AT 17,19;
 INK 4;"MMMMMMMMMMM"
 327 INK 6: PRINT AT 9,3;"H(2*#)
H(2*#)H(2*#)H"
 328 PRINT AT 15,30;"L";AT 17,15
;"L"
 329 PRINT AT 10,1;"K";AT 10,30;
"L"
 330 PRINT AT 18,2; INK 4;"%&'("
;AT 18,7;"%&'(";AT 19,2;")";AT 1
9,5;",";AT 19,7;")";AT 19,10;","
;AT 20,2;"-";AT 20,5;":";AT 20,7
;"-";AT 20,10;":"
 340 PRINT AT 19,3; INK 6;"*"; I
NK 5;"+";AT 20,3; INK 7;"."; INK
 350 PRINT AT 19,8; INK 5;"*"; I
NK 7;"/";AT 20,8; INK 3;"/"; INK
 6;"."
 360 PRINT AT 18,22; INK 5;";<";
AT 19,22;"=>";AT 20,22;"?@"
 370 LET P=0: LET T=120: LET W=0
: LET X=0: LET Y=17
 400 IF IN 64510=247 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET X=X-1
 410 IF IN 64510=251 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET X=X+1
 420 IF IN 64510=253 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1
 430 IF IN 64510=254 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y-1
 440 IF IN 64510=250 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y-1: LET X=X+1
 450 IF IN 64510=246 THEN  PRINT
 AT X,Y;"(3*#";AT X+1,Y;"(3*#)"
: LET Y=Y-1: LET X=X-1
 460 IF IN 64510=245 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1: LET X=X-1
 470 IF IN 64510=249 THEN  PRINT
 AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1: LET X=X+1
 471 IF INKEY$="p" OR INKEY$="P"
 THEN  BORDER 4: PAUSE 0: PAUSE
0: BORDER 0
 472 IF INKEY$="m" OR INKEY$="M"
 THEN  GO TO 8000
 473 IF INKEY$="0" THEN  POKE 23
606,0: POKE 23607,60: STOP
 475 IF IN 64510=239 THEN  GO TO
 510
 476 IF W<>0 AND X<0 THEN  LET X
=0
 477 IF Y<1 THEN  LET Y=1
 478 IF Y>28 THEN  LET Y=28
 480 PRINT AT X,Y;"ABC";AT X+1,Y
;"DEF"
 481 PRINT AT 3,8;S;AT 5,8;T;"#"
 482 IF T=0 THEN  GO TO 800
 483 LET T=T-1
 485 IF P=8 THEN  GO TO 305
 490 GO TO 650
 500 GO TO 400
 510 FOR Z=X+3 TO 20
 520 IF SCREEN$ (Z,Y+1)<>"#" THE
N  GO TO 550
 525 PRINT AT Z-1,Y+1;"#"
 530 PRINT AT Z,Y+1; INK 5;"G"
 540 NEXT Z: GO TO 600
 550 IF SCREEN$ (Z,Y+1)="$" THEN
  GO TO 600
 555 IF SCREEN$ (Z,Y+1)="M" THEN
  GO TO 600
 560 IF SCREEN$ (Z,Y+1)="K" THEN
  GO TO 600
 565 IF SCREEN$ (Z,Y+1)="L" THEN
  GO TO 600
 570 PRINT AT Z-1,Y+1;"#": NEXT
Z: LET S=S+10: LET P=P+1
 600 PRINT AT Z-1,Y+1;"#": GO TO
 480
 650 IF W=9 THEN  LET W=0
 655 IF X<=8 THEN  LET W=W+3
 660 IF X=9 THEN  LET W=0
 661 IF W<>0 AND Y<=15 THEN  GO
TO 8000
 662 IF W<>0 AND Y>=23 THEN  GO
TO 8000
 670 IF W>0 THEN  PRINT AT W-1,1
6; INK 3;"MMMMMMMMM": BEEP .15,3
: GO SUB 700
 675 IF W=0 THEN  GO SUB 750
 680 GO TO 400
 700 IF X=W-1 OR X+1=W-1 THEN  G
O TO 8000
 710 PRINT AT W-1,16; INK 0;"(9*
#)"
 720 RETURN
 750 LET L=INT (RND*16+1)
 751 IF X=10 OR X=9 THEN  GO TO
900
 752 IF X=16 THEN  GO TO 950
 753 IF X=14 OR X=15 THEN  GO SU
B 930
 755 IF L>=5 THEN  RETURN
 756 LET V=L+L+L
 760 FOR Q=11 TO 16: PRINT AT Q,
V; INK 4; INK 4;"I": NEXT Q: BEE
P .05,9
 765 IF V=Y OR V=Y+1 OR V=Y+2 TH
EN  GO TO 8000
 770 FOR Q=11 TO 16: PRINT AT Q,
V; INK 0;"#": NEXT Q
 780 RETURN
 800 PRINT AT 17,18;"(12*#)"
 810 FOR Z=0 TO 10: BEEP .1,9: N
EXT Z: FOR Z=0 TO 18: PRINT AT 1
7-Z,22; INK 5;";<";AT 18-Z,22;"=
>";AT 19-Z,22;"?@";AT 20-Z,22;"#
#": BEEP .05,5: BEEP .05,8: BEEP
 .05,3: NEXT Z
 820 GO TO 8000
 900 PRINT AT 10,2; INK 5;"MMMMM
MMMMMMMMM";AT 10,25;"MMMMM": IF
Y<=15 THEN  GO TO 8000
 910 IF Y>=23 THEN  GO TO 8000
 920 BEEP .1,0: PRINT AT 10,2;"(
14*#)";AT 10,25;"(5*#": GO TO 4
00
 930 PRINT AT 15,15; INK 5;"MMMM
MMMMMMMMMMM"
 935 BEEP .1,0: IF Y>=13 THEN  G
O TO 8000
 940 PRINT AT 15,15;"(15*#": RE
TURN
 950 PRINT AT 17,1; INK 5;"MMMMM
MMMMMMMMM": BEEP .1,0
8000 BEEP .1,1: BEEP .1,2: BEEP
.1,3: BEEP .1,2: BEEP .1,1: PRIN
T AT X,Y; INK 6; FLASH 1;"ABC";A
T X+1,Y;"DEF"
8020 POKE 23606,0
8030 POKE 23607,60
8040 BORDER 1: PRINT #0;"(10*sp)
GAME(3*sp)OVER(11*sp)"
8050 BORDER 0: FOR C=0 TO 75: NE
XT C: GO TO 302
```

Riverside Kingdom

TIME AGAIN to sharpen your wits and take up the reins of power to organise the affairs of a kingdom. In **Riverside Kingdom** you must decide on suitable employment for your people, to keep them well-fed and protected from bandits and natural disaster. A special problem is flooding, and you must try to build dykes to prevent it. The screen display will show how much water is on the land and how much dyke is built; ideally you should build more dyke than there is water.

The initial stages are very difficult to survive as you have little defence against a bad year, but persevere and soon you will find it possible to plan for disaster more intelligently.

The game was written for the 16K ZX-81 by Colin Hunniford of Berkhamsted in Hertfordshire.

```
  10 SLOW
  20 RAND
  30 CLS
  40 PRINT "
IDE       RIVERS
"
  50 PRINT
  60 PRINT "
OM        KINGD
"
  70 PRINT "▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀"
  80 PRINT ,,"YOU ARE THE KING O
F A SMALL LAND    BY THE GREAT YE
LLO RIVER.",,,"   YOU START WITH
500 PEOPLE AND YOU MUST DECIDE H
OW MANY FARMERS   AND DIKE WORKER
S ETC... THERE    SHOULD BE SO AS
 TO ENSURE THE       EXISTENCE OF
YOUR PEOPLE"
  90 PRINT ,,"PRESS A KEY"
 100 IF INKEY$<>"" THEN GOTO 100
 110 IF INKEY$="" THEN GOTO 110
 120 LET P=500
 130 LET D=0
 140 LET W=0
 150 LET DW=0
 160 LET FW=0
 170 LET FM=0
 180 LET SD=0
 190 LET DEAD=0
 200 LET Y=0
 210 LET B$="                    "
 220 CLS
 230 LET Y=Y+1
 240 PRINT "▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄"
 250 PRINT "▌PEOPLE:";P;TAB 31;"
▌"+"▌YEAR   :";Y;TAB 31;"▌"
 260 PRINT "▌";TAB 31;"▌"+"▌DIKE
    :";D,"WATER    :";W;TAB 31;"▌
"
 270 PRINT "▌";TAB 31;"▌";"▌";TA
B 31;"▌"
 280 PRINT "▌DIKE WORKERS  :";DW;
TAB 31;"▌"
 290 PRINT "▌FARM WORKERS  :";FW;
TAB 31;"▌"
 300 PRINT "▌FISHERMEN     :";FM;
TAB 31;"▌"
 310 PRINT "▌SOLDIERS      :";SD;
TAB 31;"▌"
 320 PRINT "▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀"
 330 IF P<1 THEN GOTO 760
 340 PRINT AT 20,0;"HOW MANY DIK
E WORKERS ?"
 350 INPUT A
 360 IF A>P THEN GOTO 340
 370 LET DW=INT A
 380 PRINT AT 7,15;DW;B$( TO LEN
B$-LEN STR$ DW)
 390 PRINT AT 20,0;"HOW MANY FAR
M WORKERS ?"
 400 INPUT A
 410 IF A>P-DW THEN GOTO 390
 420 LET FW=INT A
 430 PRINT AT 8,15;FW;B$( TO LEN
B$-LEN STR$ FW)
 440 PRINT AT 20,0;"HOW MANY FIS
HERMEN ?     "
 450 INPUT A
 460 IF A>P-(DW+FW) THEN GOTO 44
```



```
0
 470 LET FM=INT A
 480 PRINT AT 9,15;FM;B$( TO LEN
 B$-LEN STR$ FM)
 490 LET SD=P-(DW+FW+FM)
 500 PRINT AT 10,15;SD;B$( TO LE
N B$-LEN STR$ SD)
 510 PRINT AT 20,0;"
                 "
 520 LET BI=0
 530 LET D=D+INT (DW/10)-INT (RN
D*W)
 540 IF D>100 THEN LET D=100
 550 IF D<0 THEN LET D=0
 560 LET B=INT (RND*(1.9*P))
 570 PRINT AT 14,0;
 580 IF (FW*1.9+FM*1.5)<P THEN G
OSUB 950
 590 IF (FW*1.9+FM*1.5)>P THEN G
OSUB 1040
 600 IF B<SD THEN LET B=0
 605 IF B THEN LET B=B-SD
 610 LET DEAD=0
 620 IF B THEN GOSUB 1070
 640 PRINT DEAD;(" PEOPLE" AND D
EAD<>1);(" PERSON" AND DEAD=1);"
 KILLED BY BANDITS"
 650 IF W>D THEN GOSUB 780
 660 IF W<5 THEN GOSUB 870
 670 LET W=INT (RND*101)
 675 LET DEAD=P-(DW+FW+FM+SD)
 680 LET P=P-DEAD
 690 PRINT BI;(" CHILDREN" AND B
I<>1);(" CHILD" AND BI=1);" BORN"
 700 LET P=P+BI
 710 IF P<0 THEN LET P=0
 720 PRINT ,,"PRESS A KEY"
 730 IF INKEY$<>"" THEN GOTO 730
 740 IF INKEY$="" THEN GOTO 740
 750 GOTO 220
 760 PRINT ,,"YOUR PEOPLE HAVE D
IED,TOUGH LUCK"
 770 STOP
 780 LET Z=DW+FW+FM+SD
 790 LET X=(W-D)/100
 800 LET DW=INT (DW-(X*DW))
 810 LET FW=INT (FW-(X*FW))
 820 LET FM=INT (FM-(X*FM))
 830 LET SD=INT (SD-(X*SD))
 840 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FLOOD"
 850 LET DEAD=P-(DW+FW+FM+SD)
 860 RETURN
 870 LET Z=DW+FW+FM+SD
 880 LET DW=DW-INT (RND*DW/1.2)
 890 LET FW=FW-INT (RND*FW/1.2)
 900 LET FM=FM-INT (RND*FM/1.2)
 910 LET SD=SD-INT (RND*SD/1.2)
 920 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY DROUGHT"
 930 LET DEAD=P-(DW+FW+FM+SD)
 940 RETURN
 950 LET X=(P-(FW*1.9+FM*1.5))/P
 960 LET Z=DW+FW+FM+SD
 970 LET DW=DW-INT (DW*X)
 980 LET FW=FW-INT (FW*X)
 990 LET FM=FM-INT (FM*X)
1000 LET SD=SD-INT (SD*X)
1010 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
 PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FAMINE"
1020 LET DEAD=P-(DW+FW+FM+SD)
1030 RETURN
1040 LET X=(FW*1.9+FM*1.5)-P
1050 LET BI=INT X
1060 RETURN
1070 LET Z=DW+FW+FM+SD
1080 IF B>DW THEN LET DW=INT (RN
D*DW)
1090 IF B>FW THEN LET FW=INT (RN
D*FW)
1100 IF B>FM THEN LET FM=INT (RN
D*FM)
1110 IF B>SD THEN LET SD=INT (RN
D*SD)
1120 LET DEAD=Z-(DW+FW+FM+SD)
1130 RETURN
9997 STOP
9998 SAVE "KING"
9999 RUN
```



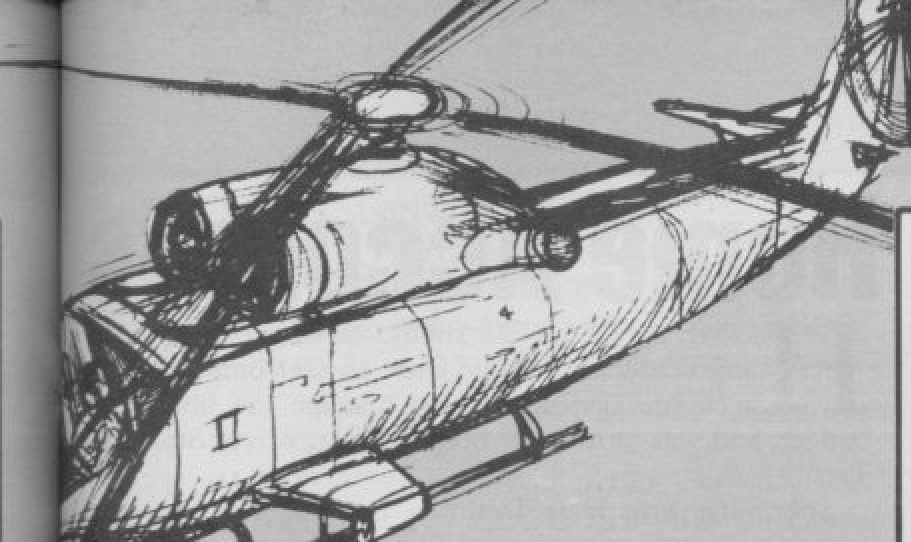


THE 3.30 EXPRESS is hurtling towards disaster. A yawning chasm waits where there used to be a bridge. It is your job, as pilot of a helicopter, to collect the pieces of bridge at the bottom of the chasm and put them back in place before the train thunders across. Unfortunately enemy helicopters and bombs impede your progress, and you must time your efforts carefully to survive. **Rail Rescue** was written for the 16K Spectrum by C Thimbleby and B Knight of Lincoln.

The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the game.

```
  10 REM Rail Rescue
  30 FOR x=0 TO 7: READ a: POKE USR "a"+x,a: NEXT x
  40 DATA 255,56,120,249,255,255,40,124
  50 FOR x=0 TO 7: READ a: POKE USR "b"+x,a: NEXT x
  60 DATA 248,144,147,243,255,255,102,102
  70 FOR x=0 TO 7: READ a: POKE USR "c"+x,a: NEXT x
  80 DATA 254,146,146,147,255,255,102,102
  90 FOR x=0 TO 7: READ a: POKE USR "d"+x,a: NEXT x
 100 DATA 0,28,16,56,124,124,124,56
 110 FOR x=0 TO 7: READ a: POKE USR "e"+x,a: NEXT x
 120 DATA 255,195,165,153,153,165,195,255
 145 GO TO 3000
 150 LET nb=0: LET ti=0: LET mi=28: LET l=11: LET c=16: LET br=0: LET li=4: LET sc=0
 162 BORDER 1: INK 7: BRIGHT 0: CLS
 165 INK 0: PRINT AT 5,0;"EEEEEEEE";AT 5,24;"EEEEEEEE": FOR f=6 TO 13: PRINT AT f,3;"E";AT f,28;"E": NEXT f
 170 INK 0: FOR f=0 TO 8: PLOT f,0: DRAW 0,127: NEXT f: LET b=127: FOR a=8 TO 56: PLOT a,0: DRAW 0,b: LET b=b-INT (RND*5) AND b>0: NEXT a
 180 INK 0: FOR f=255 TO 247 STEP -1: PLOT f,0: DRAW 0,127: NEXT f: LET b=127: FOR a=247 TO 199 STEP -1: PLOT a,0: DRAW 0,b: LET b=b-INT (RND*5) AND b>0: NEXT a
 190 INK 0: BRIGHT 1: INVERSE 1: PRINT AT 20,0;"(2*sp)TIME(3*sp):328pm(4*sp)SCORE(2*sp):000(2*sp)";AT 21,0;"(19*sp)LIVES(2*sp):004(sp)"
 195 INVERSE 0: BRIGHT 0
 200 PRINT AT 19,8; INK 2;"EEEEEEEEEEEEEEEEE"
 214 LET ac=8: LET ac1=23
 215 PRINT AT 17,ac; INK 3;"A";AT 18,ac1;"A";AT 6,ac;"A";AT 6,ac1;"A";AT 10,ac;"D";AT 12,ac1;"D"
 216 IF ATTR (l,c+1)=59 THEN LET li=li-1: FOR f=0 TO 5: FOR b=0 TO 7: BEEP .004,b: BORDER b: NEXT b: NEXT f: BORDER 1
 217 IF ATTR (l,c-1)=59 THEN LET li=li-1: FOR f=0 TO 5: FOR b=0 TO 7: BEEP .004,b: BORDER b: NEXT b: NEXT f: BORDER 1
 219 IF li<=0 THEN GO TO 2000
 220 PRINT INK 1;AT l,c;"A": IF br=1 THEN PRINT AT l+1,c;"E"
 221 IF br=1 AND l<=17 THEN PRINT AT l+2,c;"(sp)": PRINT AT l+1,c+1;"(sp)";AT l+1,c-1;"(sp)"
 222 IF l=6 AND br=1 AND ATTR (l-1,c)<>56 THEN PRINT AT l+1,c;"(sp)";AT l-1,c;"E": LET br=0: LET nb=nb+1: LET sc=sc+40
 224 IF ATTR (l+1,c)=58 THEN LET br=1: LET sc=sc+20
 240 IF INKEY$="o" AND c>8 THEN PRINT AT l,c;"(sp)": LET c=c-1
 250 IF INKEY$="p" AND c<23 THEN PRINT AT l,c;"(sp)": LET c=c+1
 260 IF INKEY$="q" AND l>6 THEN
```







```
 PRINT AT l,c;"(sp)": LET l=l-1
 270 IF INKEY$="a" AND l<18 THEN
  PRINT AT l,c;"(sp)": LET l=l+1
 275 IF nb=16 THEN  GO TO 1000
 280 PRINT AT 17,ac;"(sp)";AT 18
,ac1;"(sp)";AT 6,ac;"(sp)";AT 6,
ac1;"(sp)";AT 10,ac;"(sp)";AT 12
,ac1;"(sp)": LET ac=ac+1: LET ac
1=ac1-1: IF ac=23 THEN  GO TO 21
4: IF ac1=8 THEN  GO TO 214
 290 PRINT  INVERSE 1; BRIGHT 1;
 INK 0;AT 21,29;li;AT 20,28;sc;A
T 20,11;mi
 300 LET ti=ti+1: IF ti=254 THEN
  LET mi=mi+1: IF mi=30 AND nb<1
6 THEN  GO TO 2000
 301 IF ti=504 THEN  LET mi=mi+1
: IF mi=30 AND nb<16 THEN  GO TO
 2000
 305 IF mi<=30 AND nb=16 THEN  G
O TO 1000
 310 GO TO 215
1000 LET a$="CCCCCB": FOR f=0 TO
 26: PRINT AT 4,f; INK 4;a$;AT 4
,f-1;"(sp)": BEEP .01,-20: BEEP
.01,-20: BEEP .01,-5: NEXT f: PR
INT AT 4,26;"(6*sp)"
1010 PRINT  INK 1;AT 2,11;"WELL
DONE,";AT 3,3;" YOU HAVE SAVED T
HE TRAIN";AT 4,6; INK 2;"YOU SCO
RED ";sc;" POINTS"
1020 PAUSE 0: GO TO 3000
2000 LET a$="CCCCCB": FOR f=0 TO
 8: PRINT AT 4,f; INK 1;a$;AT 4,
f-1;"(sp)": BEEP .01,-20: BEEP .
01,-20: BEEP .01,-5: NEXT f: PRI
NT AT 4,26;"(6*sp)": FOR n=5 TO
18: PRINT AT n,8; INK 1;a$: BEEP
 .05,10-n: PRINT AT n-1,8;"(6*sp
)": NEXT n
2005 FOR s=-20 TO -30 STEP -1: B
EEP .01,s: NEXT s
2010 PRINT AT 2,12; INK 1;"BAD L
UCK,";AT 3,5;"YOU FAILED YOUR MI
SSION";AT 4,6; INK 2;"YOU SCORED
 ";sc;" POINTS"
2020 PAUSE 0: GO TO 3000
3000 CLS : BORDER 1: BRIGHT 1: P
APER 7: CLS
3010 PRINT AT 1,11; INK 2;"RAIL
RESCUE";AT 2,9; INK 1;"ECLIPSOFT
  1984"
3020 PRINT AT 5,0;"THE OBJECT OF
 THE GAME IS TO FLY"'"AROUND THE
 VALLEY FETCHING PARTS"'"OF A BR
IDGE AND TO REBUILD IT."'"ONLY Y
OU MUST DODGE THE"'"HELICOPTERS
AND BOMBS.YOU MUST"'"COMPLETE TH
E BRIDGE BEFORE"'"3:30PM,A TIME
OF TWO MINUTES,"'"OTHERWISE THE
3:30 EXPRESS WILL"'"PLUNGE INTO
THE DEPTHS OF THE"'"VALLEY."
3030 PRINT AT 15,1; INK 3;"CONTR
OLS:"; INK 2;AT 16,1;"UP....Q";A
T 17,1;"DOWN..A";AT 18,1;"LEFT..
O";AT 19,1;"RIGHT.P"
3040 PRINT  FLASH 1; INK 0;AT 20
,9;"PRESS ANY KEY": PAUSE 0: GO
TO 149
```

RAIL RESCUE



Home Accounts

HOME ACCOUNTS should be of use to virtually any reader of *Sinclair User*. It is a comprehensive accounts system to help manage the household budget, and was written by Stephen Hancock of Stoke-on-Trent.

There are three main facilities, monthly forecast, cash expenditure and bank account. The monthly forecast works in conjunction with the cash expenditure to set expenditure against income. To use the monthly forecast move the cursor with keys 6 and 8 to the desired item, and then press key 8 to alter the figures.

To exit from the cash expenditure routine, use any key except 0 or ENTER. The bank account section is independent of the other two and can store details of up to 400 cheques. You can increase this number by altering the first two DIM statements in line 8 from 400 to the desired number, up to about 1,350.

The program requires a 48K Spectrum, and uses our special abbreviations for graphics characters, so please read the instructions on the first page of the Program Printout section before typing in the listing.



```
   2 REM Home Accounts
   3 GO TO 8400
  10 CLS : PRINT AT 1,7;"Monthly
 forecast.": PRINT AT 1,7; OVER
1;"_________________"
  20 PRINT AT 3,11;"MONTHLY": PR
INT AT 6,6;"INCOME": PRINT AT 6,
17;"OUTGOING"
  30 PLOT 107,142: DRAW -40,-14:
 PLOT 124,142: DRAW 40,-14
  40 LET a(1,1)=a(1,5): PRINT AT
 8,6;"£";a(1,1)
  50 LET a(1,2)=a(1,4)+a(2,1)+a(
2,3)+a(2,5)+a(3,1)+a(3,3): PRINT
 AT 8,17;"£";a(1,2)
  55 LET a(1,3)=a(1,1)-a(1,2): I
F SGN a(1,3)=-1 THEN  LET fl=1
  60 PRINT AT 10,11; INK fl+1; F
LASH fl;"BALANCE"
  70 PRINT AT 12,11; INK fl+1;"£
";a(1,1)-a(1,2): LET fl=0
  80 PAUSE 0
  90 RETURN
1000 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"_______________": INPUT "Change
 cheque start No.?(Y/N)";y$: IF
y$="y" THEN  INPUT a(1,6)
1001 IF y$="Y" THEN  INPUT a(1,6
)
1002 INPUT  INK 0; PAPER 7;"View
 or Input?(V/I)";i$: IF LEN i$>1
 THEN  GO TO 1001
1003 IF LEN i$<1 THEN  GO TO 100
1
1004 IF i$="i" THEN  LET qu=1: G
O TO 1500
1005 IF i$="I" THEN  LET qu=1: G
O TO 1500
1006 IF i$="v" THEN  GO TO 1500
1007 IF i$="V" THEN  GO TO 1500
1009 GO TO 1001
1010 FOR f=4 TO 18 STEP 8: PRINT
 AT f,1;"Cheque(3*sp)Date(5*sp)I
nformation(2*sp)": PRINT AT f,1;
 OVER 1;"________________________
______": NEXT f
1020 FOR f=8 TO 20 STEP 8: PRINT
 AT f,1; INK 2;"Credit(3*sp)Debi
t(4*sp)Balance": PRINT AT f,1; I
NK 2; OVER 1;"___________________
___________": NEXT f
1030 PLOT 75,143: DRAW 0,-130: P
LOT 148,143: DRAW 0,-130: RETURN

1050 INPUT "Day ?";d$: IF LEN d$
>2 THEN  GO TO 1050
1055 IF CODE d$>48 THEN  IF CODE
 d$<58 THEN  LET a(j,1)=VAL d$:
PRINT AT 5,10;d$: GO TO 1060
```

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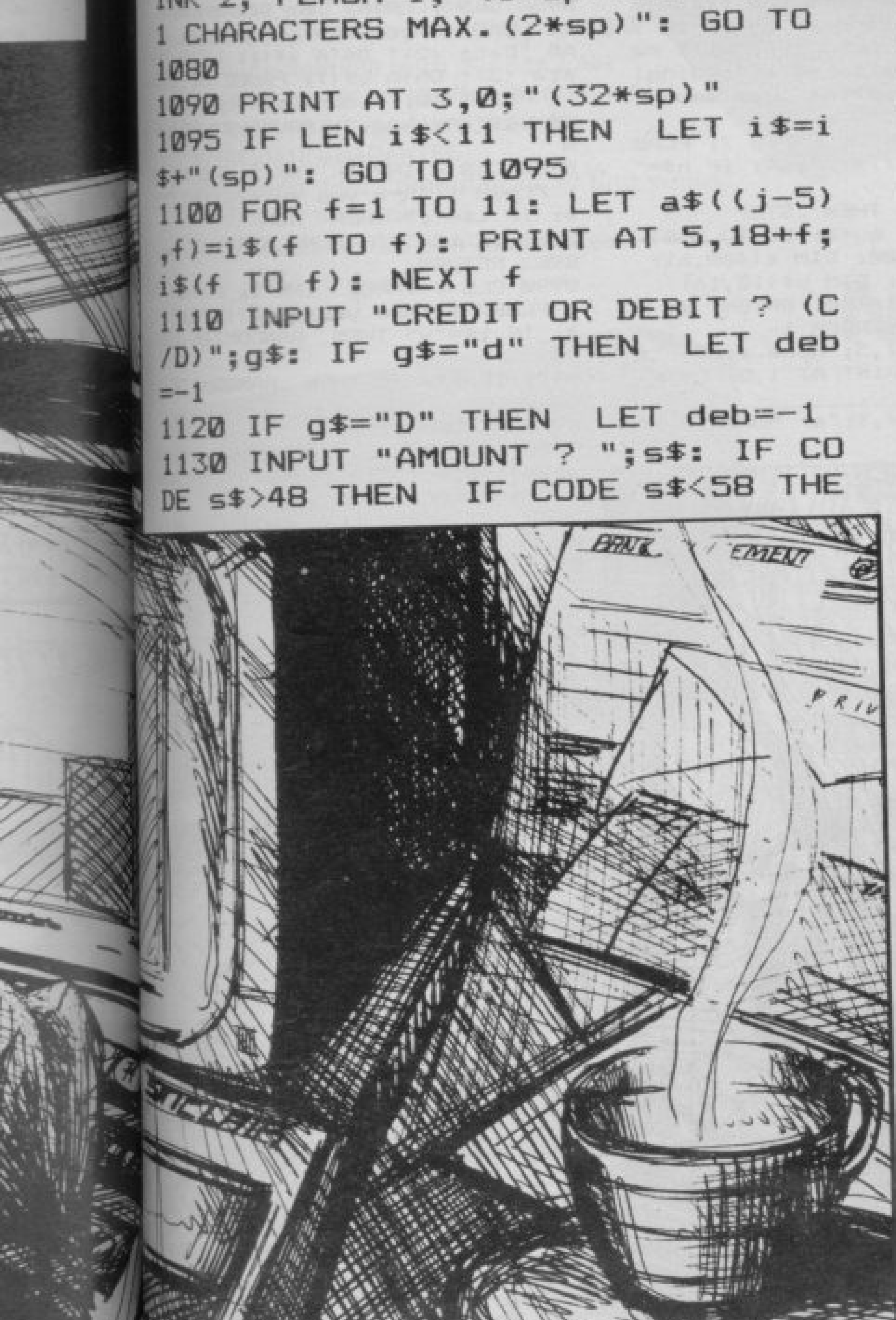
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1056 GO TO 1050
1060 INPUT "Month ?";d$: IF LEN
d$>2 THEN  GO TO 1060
1065 IF CODE d$>48 THEN  IF CODE
 d$<58 THEN  LET a(j,2)=VAL d$:
PRINT AT 5,13;d$: GO TO 1070
1066 GO TO 1060
1070 INPUT "Year ? ";d$: IF CODE
 d$>48 THEN  IF CODE d$<58 THEN
 GO TO 1076
1075 GO TO 1070
1076 IF LEN d$>4 THEN  GO TO 107
0
1077 IF LEN d$>3 THEN  LET d$=d$
(3 TO 4): GO TO 1079
1078 IF LEN d$>2 THEN  LET d$=d$
+" "
1079 PRINT AT 5,16;d$: LET a(j,3
)=VAL d$
1080 INPUT "Information ?";i$: I
F LEN i$>11 THEN  PRINT AT 3,0;
INK 2; FLASH 1;"(3*sp)TOO LONG 1
1 CHARACTERS MAX.(2*sp)": GO TO
1080
1090 PRINT AT 3,0;"(32*sp)"
1095 IF LEN i$<11 THEN  LET i$=i
$+"(sp)": GO TO 1095
1100 FOR f=1 TO 11: LET a$((j-5)
,f)=i$(f TO f): PRINT AT 5,18+f;
i$(f TO f): NEXT f
1110 INPUT "CREDIT OR DEBIT ? (C
/D)";g$: IF g$="d" THEN  LET deb
=-1
1120 IF g$="D" THEN  LET deb=-1
1130 INPUT "AMOUNT ? ";s$: IF CO
DE s$>48 THEN  IF CODE s$<58 THE
```



```
N  IF LEN s$<7 THEN  LET amo=VAL
 s$: GO TO 1135
1131 GO TO 1130
1135 IF deb=-1 THEN  LET amo=amo
*deb: PRINT AT 9,10; INK 4;amo:
GO TO 1150
1140 PRINT AT 9,1;amo
1150 LET a(j,4)=amo
1160 GO SUB 7400: IF SGN a(j,5)=
-1 THEN  LET fl=1
1170 PRINT AT 9,19; INK fl+1; FL
ASH fl;a(j,5): LET fl=0
1490 LET deb=1: LET qu=0
1491 INPUT "CONTINUE OR RETURN T
O MENU ?(4*sp)(C/R)(sp)";l$: IF
l$="c" THEN  GO TO 1495
1492 IF l$="C" THEN  GO TO 1495
1493 RETURN
1495 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"______________"
1496 LET qu=1
1500 GO SUB 1010
1510 INPUT  INK 0; PAPER 7;"Cheq
ue No.?";k$: IF LEN k$>6 THEN  G
O TO 1510
1520 IF LEN k$<1 THEN  GO TO 151
0
1530 IF CODE k$>48 THEN  IF CODE
 k$<58 THEN  GO TO 1540
1535 GO TO 1510
1540 LET chq=VAL k$
1545 IF chq<a(1,6) THEN  GO TO 1
510
1546 LET j=(chq-a(1,6))+6
1547 IF j>400 THEN  GO SUB 7900
1548 IF qu=1 THEN  IF a(j,1)>0 T
HEN  INPUT "Cheque used. CONTINU
E ? (Y/N)(3*sp)";u$: IF u$="n" T
HEN  RETURN
1549 IF u$="N" THEN  RETURN
1550 PRINT AT 5,1;chq;AT 5,12;"/
";AT 5,15;"/";AT 13,1;chq+1;AT 1
3,12;"/";AT 13,15;"/"
1555 IF qu=1 THEN  GO TO 1050
1560 PRINT AT 5,10;a(j,1);AT 5,1
3;a(j,2);AT 5,16;a(j,3)
1570 FOR f=1 TO 11:: PRINT AT 5,
f+18;a$((j-5),f): NEXT f
1580 IF a(j,4)>0 THEN  PRINT AT
9,1;a(j,4): GO TO 1600
1590 IF a(j,4)<0 THEN  PRINT AT
9,10; INK 4;a(j,4)
1595 GO SUB 7400: IF SGN a(j,5)=
-1 THEN  LET fl=1
1600 PRINT AT 9,19; INK fl+1; FL
ASH fl;a(j,5): LET fl=0
1610 LET j=j+1
1620 PRINT AT 13,10;a(j,1);AT 13
,13;a(j,2);AT 13,16;a(j,3)
1630 FOR f=1 TO 11: PRINT AT 13,
```

```
f+18;a$((j-5),f): NEXT f
1640 IF a(j,4)>0 THEN  PRINT AT 17,1;a(j,4): GO TO 1660
1650 IF a(j,4)<0 THEN  PRINT AT 17,10; INK 4;a(j,4)
1655 GO SUB 7400: IF SGN a(j,5)=-1 THEN  LET fl=1
1660 PRINT AT 17,19; INK fl+1; FLASH fl;a(j,5): LET fl=0
1670 INPUT "CONTINUE OR RETURN TO MENU ?(4*sp)(C/R)(sp)";l$: IF l$="c" THEN  GO TO 1690
1680 IF l$="C" THEN  GO TO 1690
1685 RETURN
1690 CLS : PRINT AT 1,9;"Bank Statement.": PRINT AT 1,9; OVER 1;"_______________"
1700 GO TO 1500
2000 CLS : PRINT AT 1,3;"Probable cash expenditure.": PRINT AT 1,3; OVER 1;"__________________________"
2010 PRINT AT 5,3;"ITEM";TAB 20;"Expenditure";AT 5,3; OVER 1;"____________________________"
2015 LET a(1,4)=a(4,3)+a(4,4)+a(4,5)+a(4,6)+a(5,1)+a(5,2)+a(5,3)+a(5,4)+a(5,5)+a(5,6)
2020 FOR f=1 TO 9: PRINT AT f+5,2;f;")";TAB 20;"£": NEXT f: PRINT AT 15,1;"10)";TAB 20;"£": PRINT AT 18,1;"TOTAL EXPENDITURE= £";a(1,4)
2021 FOR f=1 TO 10: FOR d=1 TO 15: PRINT AT f+5,d+4;b$(f,d): NEXT d
2022 LET f=f+20: GO SUB 7700: PRINT AT f-15,21;a(x,y): LET f=f-20: NEXT f
2025 PLOT 158,138: DRAW 0,-90
2030 PRINT AT 3,3;"Key 0 to alter items"
2040 PAUSE 0: IF INKEY$>"0" THEN  RETURN
2050 INPUT "ITEM No.?";v$: IF CODE v$>48 THEN  IF CODE v$<58 THEN  LET b=VAL v$: GO TO 2052
2051 GO TO 2050
2052 IF b<1 THEN  PRINT AT 4,0; INK 2; FLASH 1;"(9*sp)NUMBER TOO SMALL(7*sp)": PAUSE 0: PRINT AT 4,0;"(32*sp)": GO TO 2050
2055 IF b>10 THEN  PRINT AT 4,0; INK 2; FLASH 1;"(9*sp)NUMBER TOO LARGE(7*sp)": PAUSE 0: PRINT AT 4,0;"(32*sp)": GO TO 2050
2060 INPUT "ITEM ?";h$: IF LEN h$>15 THEN  PRINT AT 4,0; INK 2; FLASH 1;"(3*sp)TOO LONG 15 CHARACTERS MAX.(2*sp)": GO TO 2060
2070 IF LEN h$<16 THEN  LET h$=h$+"(sp)": GO TO 2070
2080 FOR f=1 TO 16: LET b$(b,f)=h$(f TO f): NEXT f
2090 INPUT "EXPENDITURE?";exp: LET e$=STR$ exp: IF LEN e$>6 THEN  PRINT AT 4,0; INK 2; FLASH 1;"(6*sp)TOO LONG MAX. 10 CHRS(5*sp)": PAUSE 0: PRINT AT 0,4;"(32*sp)": GO TO 2090
2100 LET b=b+2: IF b>6 THEN  LET b=b-6: LET g=1
2110 LET a(4+g,b)=exp
2997 LET g=0
2998 GO TO 2000
3000 CLS : PRINT AT 1,3;"Key in average monthly(10*sp)expenditure on the following"
3010 PRINT #0;"To exit and see forecast press 5": LET a(3,5)=a(1,5)-a(2,3)-a(2,5)-a(3,1)-a(3,3): RESTORE 9000: FOR f=5 TO 17 STEP 2: READ c$: PRINT AT f,19;"(11*sp)": PRINT AT f,3;c$;AT f,14;":- £"
3011 GO SUB 7700
3019 PRINT AT f,19;a(x,y)
3020 NEXT f
3030 PRINT AT xc,yc;">": PAUSE 10
3040 IF INKEY$="7" THEN  LET xc=xc-2: PRINT AT xc+2,yc;"(sp)": IF xc<5 THEN  LET xc=xc+2
3050 IF INKEY$="6" THEN  LET xc=xc+2: PRINT AT xc-2,yc;"(sp)": IF xc>15 THEN  LET xc=xc-2
3060 IF INKEY$="8" THEN  INPUT aq: GO SUB 7800: GO TO 3010
3070 IF INKEY$="5" THEN  GO TO y
3080 GO TO 3030
7400 FOR f=1 TO (j-6): IF a(j-f,1)>0 THEN  LET a(j,5)=a(j-f,5)+a(j,4): RETURN
7410 NEXT f: LET a(j,5)=a(j,4): RETURN
7700 IF f=24 THEN  LET x=4: LET y=6: RETURN
7705 IF f=30 THEN  LET x=5: LET y=6: RETURN
7710 LET x=INT (f/6)+1
7720 LET y=(f/6-INT (f/6))*6
7730 RETURN
7800 LET x=INT (xc/6)+1: LET y=(xc/6-INT (xc/6))*6: LET a(x,y)=aq: RETURN
7900 CLS : PRINT : PRINT "Sorry this filing system cannot cope with this amount of data.(2*sp)Increasing capacity will clear(2*sp)files and lengthen data storage and retrieval times."
7901 PRINT " To increase: break into the(4*sp)program and EDIT line 8400.Then extend the first and second(5*sp)arrays by up to 950(extra).Also line 1547 will need to be(7*sp)altered accordingly by adding(3*sp)the same amount on to the 400."
7902 INPUT  INK 2; PAPER 7; FLASH 1;"BREAK ? (Y/N) ";n$: IF n$="y" THEN  STOP
7903 IF n$="Y" THEN  STOP
7904 CLS : LET qu=0: GO TO 8401
8400 GO SUB 9500: DIM a(400,6): DIM a$(400,11): DIM b$(10,16)
8401 PAPER 7: INK 0: BRIGHT 0: FLASH 0: CLS : BORDER 1
8500 PRINT AT 1,5;"Home accounts controler": PRINT AT 1,5; OVER 1;"_______________________"
8510 PRINT AT 4,3;"a) Monthly forecast."
8520 PRINT AT 6,3;"b) Bank statement."
8530 PRINT AT 8,3;"c) Probable cash expenditure."
8540 PRINT AT 10,3;"d) Alter forecast."
8550 PRINT AT 12,3;"e) Save data to tape.": PRINT AT 14,3;"f) Load data from tape."
8555 PRINT AT 16,3;"g) Reset program."
8556 PRINT AT 18,3;"h) Quit program."
8560 INPUT "Select option:-";o$
8570 RESTORE 9800: FOR f=0 TO 15: READ q$,q: IF q$=o$ THEN  GO SUB q: GO TO 8401
8580 NEXT f: GO TO 8560
8900 SAVE "Banc Data" DATA a(): POKE 23736,181: PAUSE 60: SAVE "Data (2)" DATA a$(): POKE 23736,181: PAUSE 60: SAVE "Data (3)" DATA b$(): PRINT  0; FLASH 1;"Stop tape.Press any key.": PAUSE 0: INPUT "VERIFY DATA ? (Y/N) ";s$: IF s$="y" THEN  GO TO 8930
8910 IF s$="Y" THEN  GO TO 8930
8920 RETURN
8930 VERIFY "Banc Data" DATA a(): VERIFY "Data (2)" DATA a$(): VERIFY "Data (3)" DATA b$(): RETURN
8950 CLS : PRINT  0;"Start tape.": LOAD "Banc Data" DATA a(): LOAD "Data (2)" DATA a$(): LOAD "Data (3)" DATA b$(): PAUSE 5: CLS : PRINT #0; FLASH 1;"Stop tape. Press any key.": PAUSE 0: RETURN
8980 CLS : INPUT  INK 2; PAPER 7; FLASH 1;"Are you sure?(Y/N)";t$: IF t$="y" THEN  RUN
8981 IF t$="Y" THEN  RUN
8982 RETURN
8990 CLS : INPUT  INK 2; PAPER 7; FLASH 1;"Are you sure?(Y/N)";t$: IF t$="y" THEN  RANDOMIZE USR 0
8991 IF t$="Y" THEN  RANDOMIZE USR 0
8995 RETURN
9000 DATA "Income","Mortgage","Rates","Gas","Electricity","Other","Net income"
9500 LET xc=5: LET yc=1: LET fl=0: LET qu=0: LET deb=1: LET amo=0: LET x=0: LET y=0: LET g=0: LET u$=""
9501 RETURN
9800 DATA "a",10,"b",1000,"c",20
```



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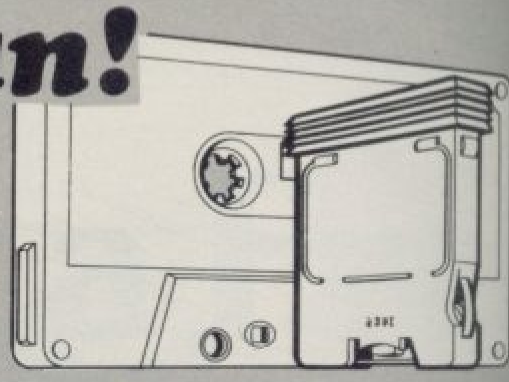
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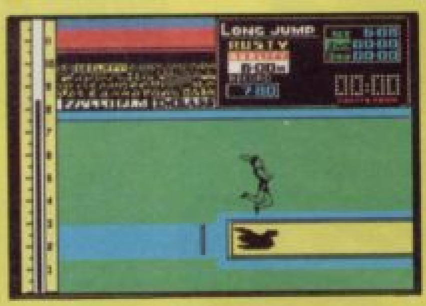
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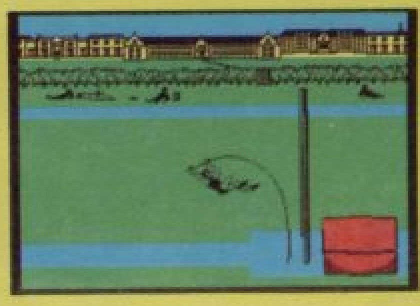
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Adding commands to Spectrum Basic

Keith Williams presents a detailed explanation on how to use interrupts on the Spectrum and provides a useful trace function for printing program line numbers

ONE OF THE problems of adding new commands and routines to the Spectrum Basic is that it is held in ROM. That means that all the computer operations are under the control of an immutable program which cannot be stopped.

Although it is easy to write new routines they can only be called by means of a very user unfriendly RAND USR call. Passing of information into and out of those routines is also difficult without a whole chain of pokes. Even then it may be impossible to get the routine to work as it may be needed at the execution of every line.

There is, however, one very simple way of beating the ROM and that is to use interrupts. While exploring this idea we can also develop a new command for the the Spectrum. If you are not interested in the detailed explanation you can still follow the instructions and load up the final program which gives a very useful trace function, an essential tool when debugging along Basic programs.

A trace function is a machine code routine which prints on screen, while a program is running, the number of the line which is currently being executed.

The Spectrum is based on the popular Z-80A microprocessor. On that microprocessor are two electrical connections which are involved with interrupts. The first is the NMI which is of little use to our present purposes and so we will ignore it. When the voltage applied to the other pin changes we say that an interrupt occurs. That causes the processor to stop what it is doing, make a note of where it has reached and then jump to follow another program called the interrupt service routine. When that is finished it returns to its place in the original program.

There are three interrupt modes available on the microprocessor. IM0 is designed for use with peripherals such as printers and the like. When the peripheral needs servicing, such as requiring more information, then it sends the interrupt message and then an address. The computer, in IM0, will run the routine starting at that address before returning from the interrupt.

IM1 is the mode normally used by the Spectrum. When an interrupt occurs it will carry out the routine at address 56. That routine in the ROM does various housekeeping tasks such as reading the keyboard. The Spectrum is wired in such a way that an interrupt comes with every fluctuation in the mains voltage, in Britain that occurs 50 times a second.

Listing 1: Hexloader

```
   5 DEF FN z$(n)=z$(n+1)
  10 DEF FN a(x$)=CODE x$-48-7*(
x$>="A")
  15 DEF FN b()=16*FN a(a$(1))+F
N a(a$(2))
  20 POKE 23658,8
  30 INPUT "Start address "; LIN
E b$
  40 LET a$=b$(1 TO 2): LET h=FN
 b(): LET a$=b$(3 TO 4): LET l=F
N b()
  50 POKE 23728,h: POKE 23729,l:
 LET s=256*h+l: CLEAR s-1
  55 LET z$="0123456789ABCDEF"
  60 LET start=256*PEEK 23728+PE
EK 23729: LET add=start
  70 GO SUB 2000
  75 PRINT 'f$;"    ";
  80 INPUT "Enter code "; LINE b
$
  90 IF b$="" THEN  GO TO 80
 100 IF b$(1)="R" THEN  LET add=
add-1: GO TO 70
 105 IF b$(1)="S" THEN  GO TO 50
0
 110 IF LEN b$<2 THEN  GO TO 80
 120 LET a$=b$( TO 2): LET byte=
FN b()
 130 POKE add,byte: LET add=add+
1
 135 PRINT a$;"  ";
 140 IF LEN b$>2 THEN  LET b$=b$
(3 TO ): GO TO 100
 150 GO TO 70
 500 INPUT "Do you want to save
"; LINE b$
 510 IF b$="N" THEN  STOP
 520 INPUT "Name "; LINE b$
 530 CLS : SAVE b$CODE start,add
-start
 540 STOP
2000 REM change to hex
2010 LET h=INT (add/256): LET hh
=INT (h/16): LET f$=FN z$(hh)+FN
 z$(h-hh*16)
2020 LET h=add-h*256: LET hh=INT
 (h/16): LET f$=f$+FN z$(hh)+FN
z$(h-hh*16)
2030 RETURN
```

IM2 is much more useful. In that mode the processor jumps to a service routine the address of which must calculate from two numbers. The first of those numbers comes from the thing causing the interrupt. In a Spectrum this number 255 — or FF in Hex — is supplied by the hardware. The other number is programmed in. It is kept in a special store known as the I register. The processor jumps to the address 256*I+255. Just to make things more complicated this computed address is not the start address but is the address of a store holding the start address.

To get our program on the way we must first poke its start address into another address — whose Hex value is xxFF. Then we must put its vector address — the xx from before — into I. That sounds complicated but really it is simple. There is, however, one problem. The screen chip in the Spectrum works in such a way that putting the vector in the first 16K of RAM causes difficulties for the machine. If you want to use interrupt routines on a 16K machine you must be very devious. If you put 40 into the I register then the processor will look at 40*256+255=10495 for a start address. That is in ROM and it contains the start address 32348 or 7E5C in Hex. On the 48K Spectrum you have more leeway and can either use the 16K trick or use the number 128 (80 Hex) in I.

And so to the routines. A word first about getting them into memory. If you have an assembler then it is easy. If you do not then you will need a **Hexloader** program. One is provided in listing 1. You must first type it in and then save it. It enables you to type in the machine code and then save that.

When entering the machine code routines in listing 2 type in only the digits

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and letters in the column 'hexcode'. Type in a whole line at a time and the address and code will appear on the screen. If you make a mistake then typing in 'r' will enable you to retype the previous line. When you have typed the last line of hex then an 'S' will lead to a save routine to keep the hex on tape.

To minimise errors and make it easier to explain the program as a whole, it has been divided into its various subroutines. Type those in one at a time; later they can be put together, using the **Collator** program in listing 3.

The first pair of routines, **TRON** and **TROFF,** are the ones which switch the interrupt vectors around. TRON loads the register I with 0FEH, that is, 254. That means that the vector holding the start address of our routine must be placed at address 0FEFFH, that is, 65279. The register I cannot be loaded directly and so we must first load the value into the A register. IM2 is selected for the reasons already stated and the remaining instructions DI and EI switch interrupts off and on. Strictly speaking they are not essential here but it might cause confusion for the machine if it was interrupted during this short routine at the wrong place.

TRON is really quite separate from the rest of the program. Its job is to set the machine up so that we can switch the trace function on or off at will. It must therefore be called early on by a USR call. More about that later when the whole program is in.

TROFF performs the opposite function in that it resets the machine to normal interrupts. You will notice that I is loaded with 3FH or 63. That is the address (3FFF) that the ROM sets up as an interrupt vector on power up. In interrupt mode 2 that would cause a jump to address 60 which is part way through the normal interrupt routine. It is important, therefore, when resetting to put the machine into IM1. The only USR call that is necessary anywhere in this program is the initial one to TRON. TROFF is called by means of a normal Basic variable.

Type in the machine code and save it. The start address is FE7E. The pair of routines can be saved together under the name 'tron'.

Once the whole program is in and enabled it is necessary to be able to switch the trace on and off. That can be done from Basic by inserting the line LET trace = x, where x can be one of three values: '1' will cause a call to TROFF thereby disabling trace; '0' will

Listing 2. TRON & TROFF

Add	hexcode	label	Assembler		Comments
FE7E	F3	TRON	DI		switch off interrupts
FE7F	3EFE		LD	A,0FEH	set up vector address
FE81	ED47		LD	I,A	to FEFF
FE83	ED5E		IM	2	select mode 2
FE85	FB		EI		switch interrupts on
FE86	C9		RET		return to BASIC
FE87	FE	TROFF	DI		interrupts off
FE88	3E3F		LD	A,3FH	restore the interrupt
FE8A	ED47		LD	I,A	vector address to 3EFF
FE8C	ED56		IM	1	restore mode 1
FE8E	FB		EI		interrupts on
FE8F	C9		RET		return
		TRQ			
		ELINE	EQU	5C59H	
		VARS	EQU	5C4BH	
		ORG	0FE90H		
FE90	2A595C	TRQ	LD	HL,(ELINE)	calculate the length
FE93	ED5B4B5C		LD	DE,(VARS)	of variables area
FE97	A7		AND	A	
FE98	ED52		SBC	HL,DE	
FE9A	E5		PUSH	HL	put length into BC
FE9B	C1		POP	BC	
FE9C	EB		EX	DE,HL	put variables start in to HL
FE9D	3EB4	SEARCH	LD	A,0B4H	put code for "t" as first letter into A
FE9F	EDB1		CPIR		carry out search
FEA1	2806		JR	Z,FOUND	
FEA3	78		LD	A,B	end of variables?
FEA4	B1		OR	C	
FEA5	2824		JR	Z,ZERO	if so then there is no trace
FEA7	18F4		JR	SEARCH	search on
FEA9	3E72	FOUND	LD	A,72H	is next letter "r"?
FEAB	BE		CP	(HL)	
FEAC	20EF		JR	NZ,SEARCH	search on if not
FEAE	23		INC	HL	is next byte "a"?
FEAF	3E61		LD	A,61H	
FEB1	BE		CP	(HL)	
FEB2	20E9		JR	NZ,SEARCH	
FEB4	23		INC	HL	is next byte "c"?
FEB5	3E63		LD	A,63H	
FEB7	BE		CP	(HL)	
FEB8	20E3		JR	NZ,SEARCH	
FEBA	23		INC	HL	is next byte last letter
FEBB	3EE5		LD	A,E5H	and is it "e"?
FEBD	BE		CP	(HL)	
FEBE	20DD		JR	NZ,SEARCH	
FEC0	23		INC	HL	jump over first byte
FEC1	23		INC	HL	
FEC2	7E		LD	A,(HL)	look at sign byte
FEC3	3C		INC	A	jump forward if negative
FEC4	280A		JR	Z,NEG	
FEC6	23		INC	HL	is next byte 1?
FEC7	7E		LD	A,(HL)	
FEC8	3D		DEC	A	
FEC9	2802		JR	Z,ONE	jump forward if it is
FECB	AF	ZERO	XOR	A	trace must be 0 so load
FECC	C9		RET		A with 0 and return
FECD	3E01	ONE	LD	A,1	load A with 1 and
FECF	C9		RET		return
FED0	3EFF	NEG	LD	A,FF	load A with -1 and return
FED2	C9		RET		
			PRINT		
		ORG	OFED3H		
FED3	E5	PRINT	PUSH	HL	save HL
FED4	2I1840		LD	HL,40I8H	screen address
FED7	5F		LD	E,A	get print position
FED8	1600		LD	D,0	into DE
FEDA	19		ADD	HL,DE	
FEDB	EB		EX	DE,HL	
FEDC	0600		LD	B,0	
FEDE	21803D		LD	HL,3D80H	character position for '0'
FEE1	79		LD	A,C	get digit in to A
FEE2	87		ADD	A	multiply by 8
FEE3	87		ADD	A	

```
FEE4   87                     ADD    A
FEE5   4F                     LD     C,A          and put into C
FEE6   00                     NOP
FEE7   09                     ADD    HL,BC        calculate position in table
FEE8   0608                   LD     B,8          there are 8 bytes
FEEA   7E          LOOP1      LD     A,(HL)       pick up bytes
FEEB   2F                     CPL                 invert byte
FEEC   12                     LD     (DE),A       print it
FEED   14                     INC    D            next pixel line 256 bytes
                                                  further on
FEEE   23                     INC    HL           next byte
FEEF   10F9                   DJNZ   LOOP1        all 8 bytes
FEF1   E1                     POP    HL           restore HL
FEF2   C9                     RET
                       COUNT & LINE
                   ORG        OFEF3H
                   PPC        EQU    5C45H
                   PRINT      EQU    OFED3H
FEF3   0E00        COUNT      LD     C,0          set counter to 0
FEF5   OC          LOOP2      INC    C            increase count each time
                                                  through loop
FEF6   A7                     AND    A
FEF7   ED52                   SBC    HL,DE        perform subtractions
FEF9   30FA                   JR     NC,LOOP2     repeat till past 0
FEFB   0D                     DEC    C
FEFC   19                     ADD    HL,DE        and difference back
FEFD   1802                   JR     JUMP         jump over vector
FEFF   2D                     DEFB   2DH          the vector (FF2D is
                                                  MAIN)
FF00   FF                     DEFB   OFFH
FF01   C9          JUMP       RET
FF02   2A455C      LINE       LD     HL,(PPC)     pick up line number
FF05   11E803                 LD     DE,3E8H      a thousand
FF08   CDF3FE                 CALL COUNT          how many thousands
FF0B   3E01                   LD     A,1          first digit
FF0D   CDD3FE                 CALL PRINT          print it
FF10   116400                 LD     DE,64H       now hundreds
FF13   CDF3FE                 CALL COUNT
FF16   3E02                   LD     A,2          second digit
FF18   CDDEFE                 CALL PRINT
FF1B   110A00                 LD     DE,0AH       tens next
FF1E   CDF3FE                 CALL COUNT
FF21   3E03                   LD     A,3          third digit
FF23   CDD3FE                 CALL PRINT
FF26   4D                     LD     C,L          now the units
FF27   3E04                   LD     A,4          fourth digit
FF29   CDD3FE                 CALL PRINT
FF2C   C9                     RET
                   MAIN
                   ORG        0FF2D
                   PPCH       EQU    5C46H
                   TRQ        EQU    0FE90H
                   LINE       EQU    0FF02H
                   TROFF      EQU    0FE87H
FF2D   FF          MAIN       RST    38H          carry out normal inter-
                                                  rupt routine
FF2E   F5                     PUSH   AF           save A & F
FF2F   3A465C                 LD     A, (PPCH)    is a program running?
FF32   3C                     INC    A            PPCH holds FF if not
                                                  running a program
FF33   2002                   JR     NZ,RUN       jump if it is
FF35   F1                     POP    AF           restore flags and
FF36   C9                     RET                 return
FF37   C5          RUN        PUSH   BC           save all regs
FF38   D5                     PUSH   DE
FF39   E5                     PUSH   HL
FF3A   CD90FE                 CALL TRQ            check variable trace
FF3D   3D                     DEC    A            if A not 1 then jump
FF3E   2005                   JR     NZ,NOTON     forward
FF40   CD02FF                 CALL LINE           perform trace
FF43   1806                   JR     RTN          jump to return
FF45   3C          NOTON      INC    A            is trace 0? If so then
FF46   2803                   JR     Z,RTN        just return
FF48   CD87FE                 CALL TROFF          disable trace
FF4B   E1          RTN        POP    HL           restore regs
FF4C   D1                     POP    DE
FF4D   C1                     POP    BC
FF4E   F1                     POP    AF
FF4F   C9                     RET                 return to BASIC
```

switch trace off but leave it enabled. '1' will switch trace on. So if in your program you wish to trace through lines 300 to 700, say, insert in your program at line 299 LET trace = 1. Line 70I — LET trace = 0 — stops the trace. Then run the program.

The next routine **TRQ** searches the variables area to see if the variable trace exists. If it does not then it assumes a value of 0. If it does exist then the value is picked up. The method of finding the variable is to search through the variables area for the code 0B4H which is the code for 't' adjusted to show that it is the first letter of a long name variable (see page 167 of the manual, letter code 96 + 160). When the code is found each of the codes in turn is checked against the letters 'r', 'a' and 'c' finally against 0E5H which is the code for 'e' + 128, showing that it is the last letter of the name.

The value of a number is stored in five bytes. The first is 0, the second the sign byte holding 0 for a positive number and -1 for a negative. The routine first picks that byte and adds one to it. If the answer is 0 then the A register is loaded with FF (-1) and a return to the main control routine is effected. If it is not negative then the next byte is looked at. That is the least significant byte of the value, i.e. x−256* INT (x/256). The byte is picked up and decreased by one. If the answer is 0 then it must have held 1 and so A is loaded with 1 and a return made. The only possible remaining value is 0 and so 0 is put into A and then the program returns to the main control.

There are, probably, easier methods of doing this, for example using the LOOK-VARS routine in ROM at address 28B2H, but it is important not to alter any of the system variables or the alternate register set because the processor is in the course of running a Basic program. Consequently no ROM routines at all have been used but only simulations of them.

Now type in TRQ and save it under that name. The start address is FE90.

The **Print** routine is the one that prints out the line number. Again there would be easier ways of doing it, using RST IOH for example, but again a simulation has been produced. The routine is entered with 'C' holding the value of the digit and 'A' its position — 1 for thousands, 2 for hundreds etc.

Every character printed on the screen consists of eight rows of eight pixels. Each row can be represented as one byte. As the screen is 32 bytes wide it

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continued from page 123

would seem that the easy way to print a character is to poke the first byte in and then the next byte 32 bytes further on and so on. The problem is that the screen is not laid out in memory in that simple and obvious way. In fact, each row of pixels is 256 bytes away from the last one. The algorith therefore requires that each byte is poked into an address 256 bytes on from the previous. The pixel bytes are stored at an address pointed to by CHARS + 256 and the numbers start 128 bytes further on. As there are eight bytes for each character then the value in C must be multiplied by eight and then added to that base address.

The routine may now be typed in and saved using the name "print". The start address is FED3.

The next two routines are involved in sorting the current line number. **Count** divides the number in HL by the number in DE and returns the result in C and the remainder in HL. **Line** picks up the line number and uses Count to manipulate it digit by digit and then prints those out by calls to Print. The current line number is held in PPC so that is first picked up in HL. DE is loaded with 1000 and then Count is called to see how many thousands there are. The number is printed using A to say the print position i.e. the thousands column. Then that is repeated for the hundreds and so on. Count overlaps the interrupt vector at FEFFH and there must be a jump just before it so that the processor does not interpret the vector as instructions.

The start address for this pair of routines is FEF3. They can be typed in and saved.

The final routine is the control routine called **MAIN** and it controls all the others and performs the necessary housekeeping tasks. The start address is FF2D; the one held in the interrupt vector FEFF. It is the routine called when an interrupt occurs.

The first task is a call to ROM address 56. That is the normal interrupt routine and it updates FRAMES, reads the keyboard and so on. Next the A register and the Flags register are saved so that normal service can be resumed on return. If a program is not running it will hold FF(-1) and then a return is made after restoring A and the flags register. If a program is running then the registers are saved and a call made to TRQ to see if the trace is to be switched on, off or disabled. TRQ return that information in the A register. Depending on the value in that register a call is made to LINE or TROFF or none of those. Finally, all the registers are restored and control is returned to the ROM. All that remains is to collate all those routines. Type in the second Basic program in listing 3, rewind the tape and then run it, not forgetting to save MAIN first.

The third Basic program — listing 4 — will load the trace utility above RAMTOP. It, or something like it, must be used on switching on and before you load or type in the program under test. To enable the trace, i.e. to call TRON, you need to give the command RAND USR 65150 after any start or NEW.

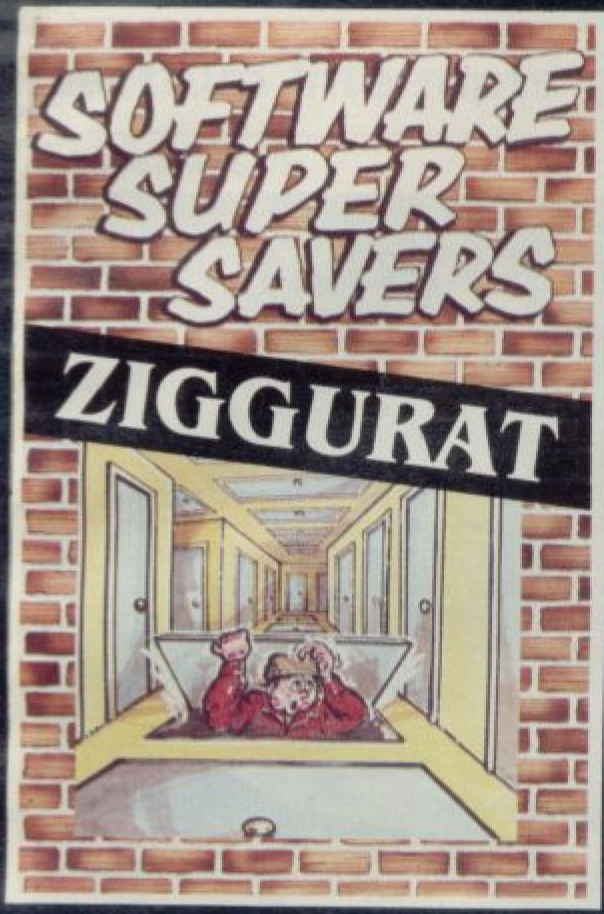
Further sophistications can be added, such as a delay loop at the end of MAIN which will make it easier to follow the trace.

Listing 3: Collator

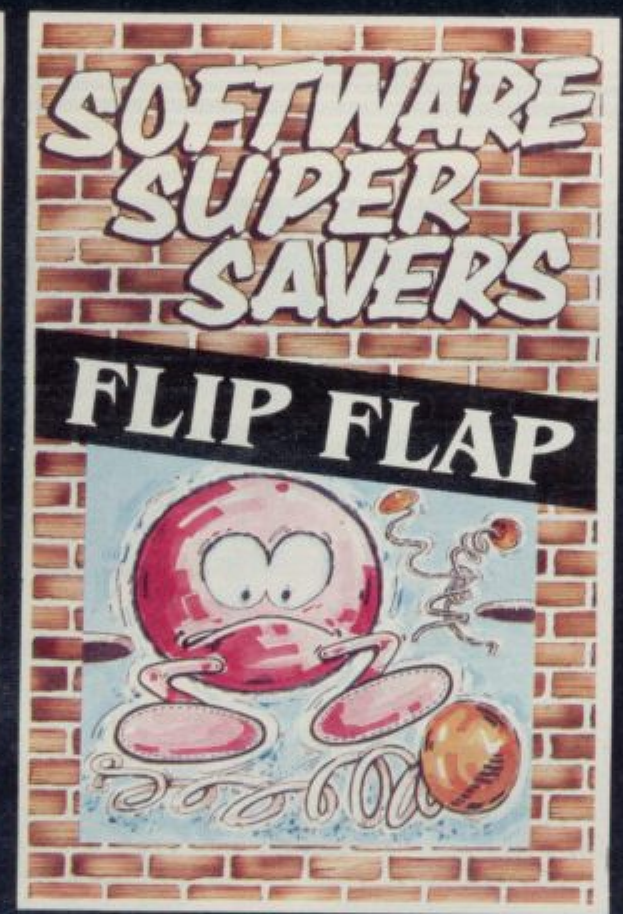
```
  10 CLEAR 65419
  20 FOR n=0 TO 4: LOAD ""CODE :
 NEXT n
  30 CLS : PRINT "Prepare tape f
or saving  Press  ENTER"
  40 PAUSE 4e4
  50 SAVE "trace"CODE 65150,214
  60 STOP
```

Listing 4: Trace

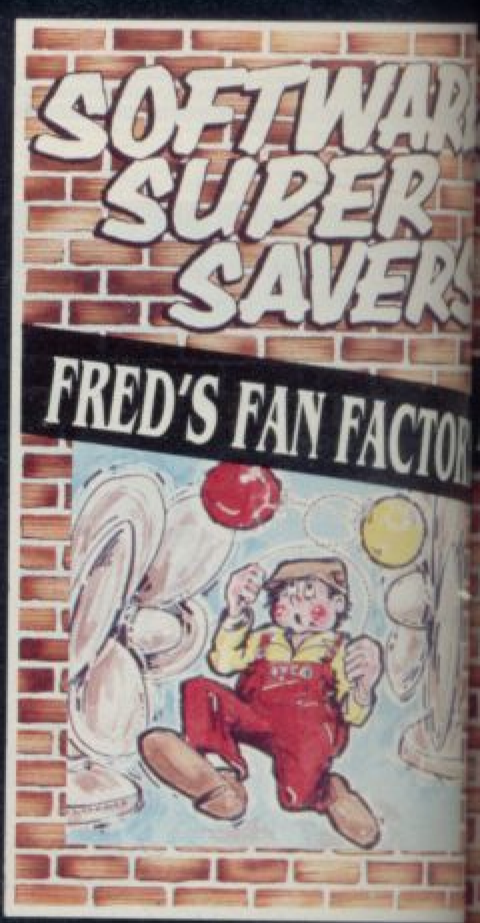
```
  10 CLEAR 65149
  20 LOAD "trace"CODE
  30 NEW
```



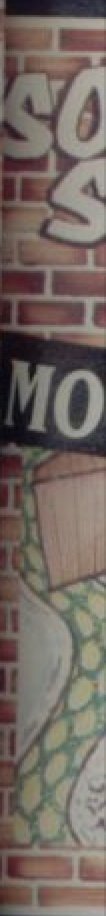
Lured by the promise of untold riches, our intrepid hero enters the temple of Ziggurat, a place of ill legend. All he has to do is grab the money and run, but he can't quite remember which way he came in, and what is that shuffling sound coming from the crypt.
Available on the 48K Spectrum.



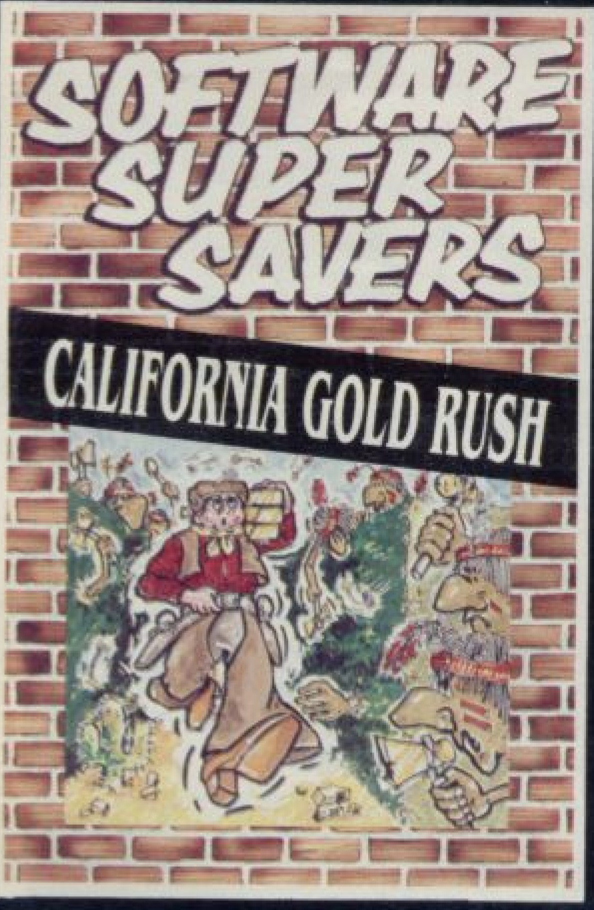
A pin ball game with a novel twist. There are twenty tables to be negotiated, each by reaching a target level. Each table has a different theme with original 'bonus' features. Will you dare to use the gamble feature? You could gain an extra ball – or lose 5,000 points!
Available on 48K Spectrum



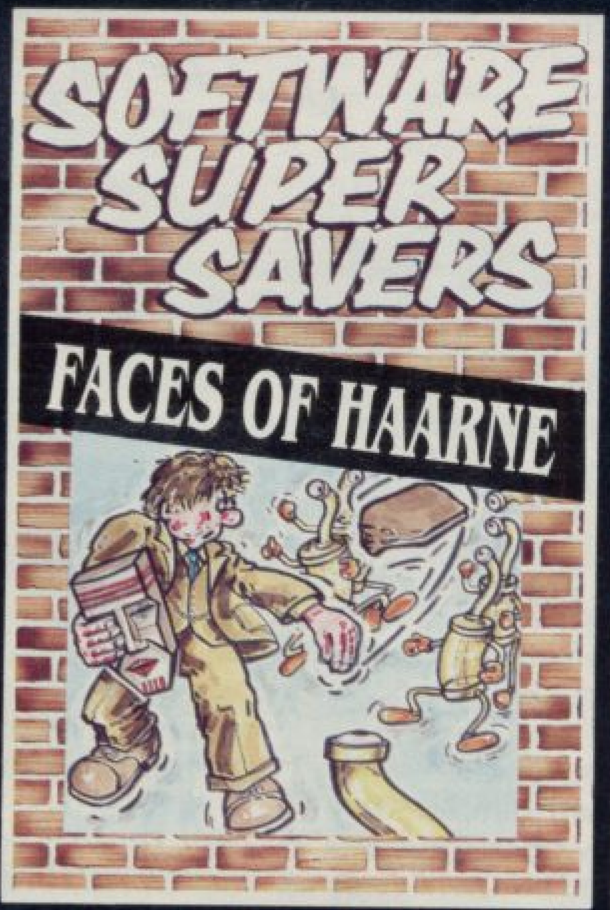
It's Fred's first day at his new job; guiding balloon men through the fac passages using fans to blow them to freedom. Easy? It looks that way unti the balloon men come under seige fr spinning knives, fireballs, spikes and explosives, Fred is starting to panic, c you help him.
Available on the 48K Spectrum.



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In the heart of hostile Indian Country, prospector Jake has discovered a fabulous fortune in gold, spread out in 24 rich fields. To claim these riches he has to fence off each mine. The Indians, alas, have other ideas, tearing down his fences and attacking him with arrows and tomahawks. Can Jake block the Indians with carefully placed sticks of dynamite and stake his claim to the fortune.
Available on the Commodore 64.



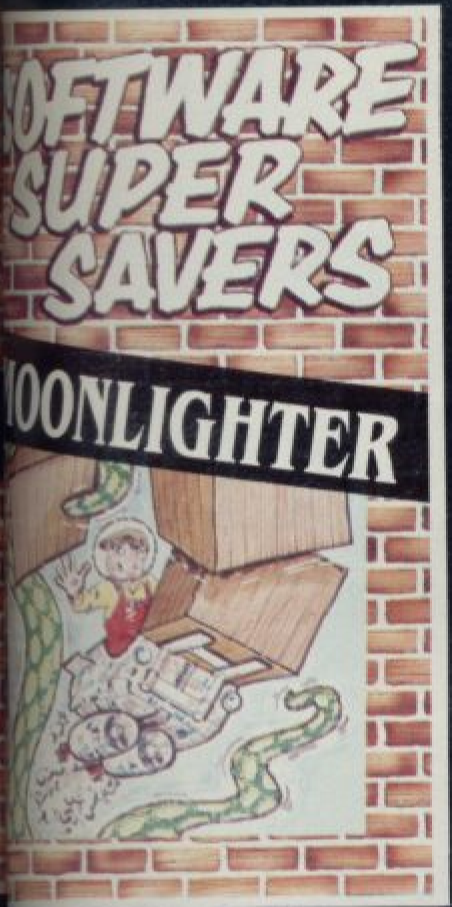
Night falls over the city and at the local museum Herbert the curator is doing his rounds. As he approaches the Green Room containing the mysterious and fabulously valuable "Faces of Haarne", strange noises can be heard from within. Armed with his steel-rimmed "Odd-Job" hat, Herbert enters the room. You won't believe what he encounters!
Available on the Commodore 64.



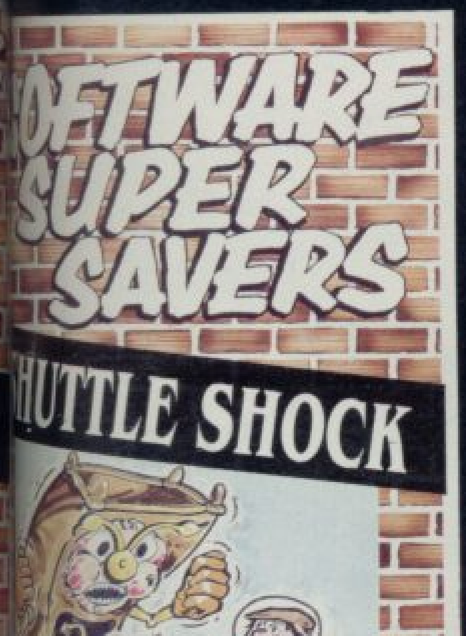
All has been quiet at the Trans-Cosm outpost for the past 50 Intergalactic Standard Time Units. Suddenly, out of nowhere, appear hoardes of alien marauders – 100 waves of them. This it; the moment you've been waiting fo the chance to gain your stripes.
Available on the 48K Spectrum.



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re the Commander of a Space tle ferrying cargo to Arcturus and all rts north. Whilst checking the tory, which includes Mega-Tennis , Clockwork Oranges and Intoxo- nges, you hear some very peculiar ds coming from the hold. Dare you tigate?
ble on 48K Spectrum.



on the astronaut has crash-landed e planet Epsilon XI and the power s that propel his rocket have been rsed around the planet. Algies s to re-assemble his power packs ndered by some rather eccentric ms; stinkers, mutant lawn rs, grandfather clocks?? What kind et is this?
ble on the 48K Spectrum.

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Of course, your skill can help our hilarious hero to complete the necessary litter collection at every location, so he can earn the money to fly on to the next country in his round the world quest. And as he visits every continent on Earth in search of rubbish you can share every fun filled, thrill packed second with him.
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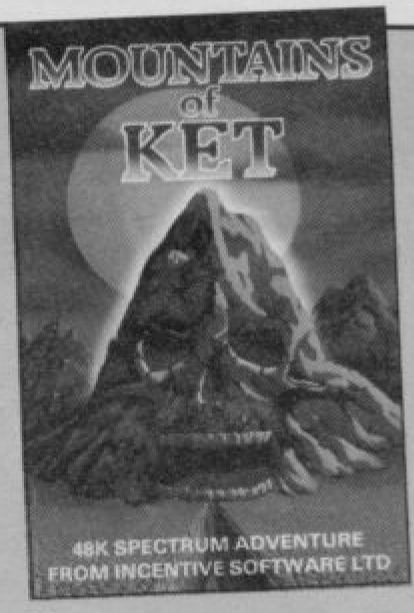
Incentive Software *and* Sinclair User *are giving 100 presentation packs of the* Ket Trilogy *to the winners of our cryptic*

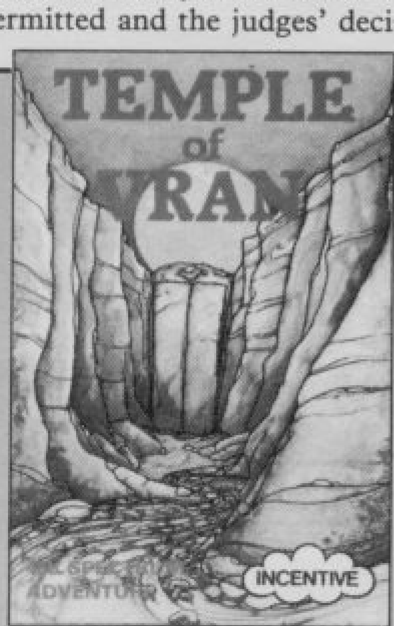
GREAT KET COMPETITION

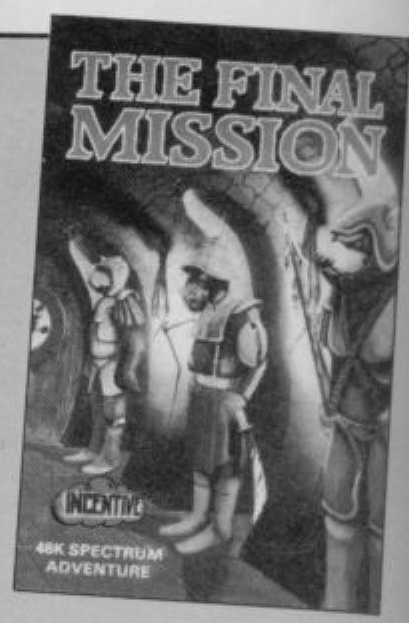
CAN YOU decode the secret message and win the classic adventure game **Mountains of Ket,** together with its sequels, **Temple of Vran** and **The Final Mission.**

Examine the brief extract opposite from the diary of an unfortunate explorer who failed to defeat the evil Vran and his high priestess, Delphia. Hidden in the extract is a mathematical expression. Write the answer, which is a three figure number, on a postcard together with your name, address and telephone number. Post it to: Ket Trilogy Competition, *Sinclair User,* EMAP Publications, 67 Clerkenwell Road, London EC1R 5BH, to arrive not later than Friday November 16. The first 100 correct entries pulled from the bag after that date will win the presentation packs.

Employees of EMAP Publications and Incentive Software, their relatives and associates are ineligible. Only one entry per person is permitted and the judges' decision is final.







The Ket Trilogy

UNJUSTLY condemned for a murder you did not commit, you have been offered the chance of escaping the hangman's noose by undertaking a perilous quest. You must seek out and destroy the evil Delphia and Vran Verusbel, priestess and leader of the cult of the mad monks.

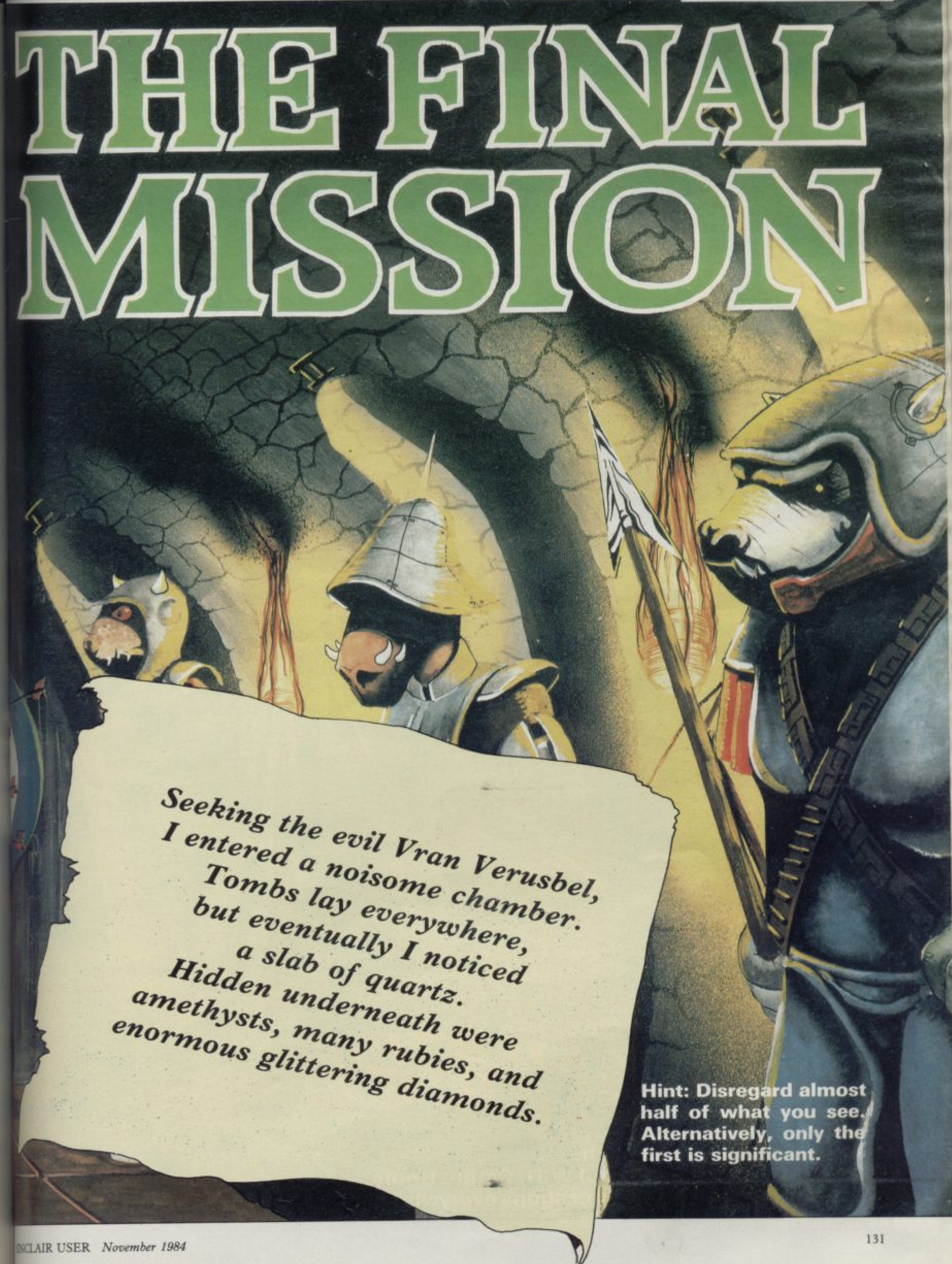
The quest spans three adventures, **Mountains of Ket, Temple of Vran,** and now, completing the long haul, **The Final Mission.** In the first you must travel to the Mountains of Ket, and then underground, fighting monsters as you go. Once through the mountains, the second part begins, in which you must seek the temple of the cult of the mad monks and destroy it.

The Final Mission, only recently released, brings you to the ultimate showdown with Vran himself, penetrating his inner sanctum beyond the Guardians of the Gate. All three adventures will be available in the shops in a presentation gift pack costing £12.95, but you have the chance to win them for free in this *Sinclair User* competition.

There is a rather more substantial prize awaiting the lucky adventurer who manages to complete the whole of the trilogy. Incentive Software is offering £400 worth of video equipment to the first player to decipher the hidden message, one part of which is revealed at the end of each program.

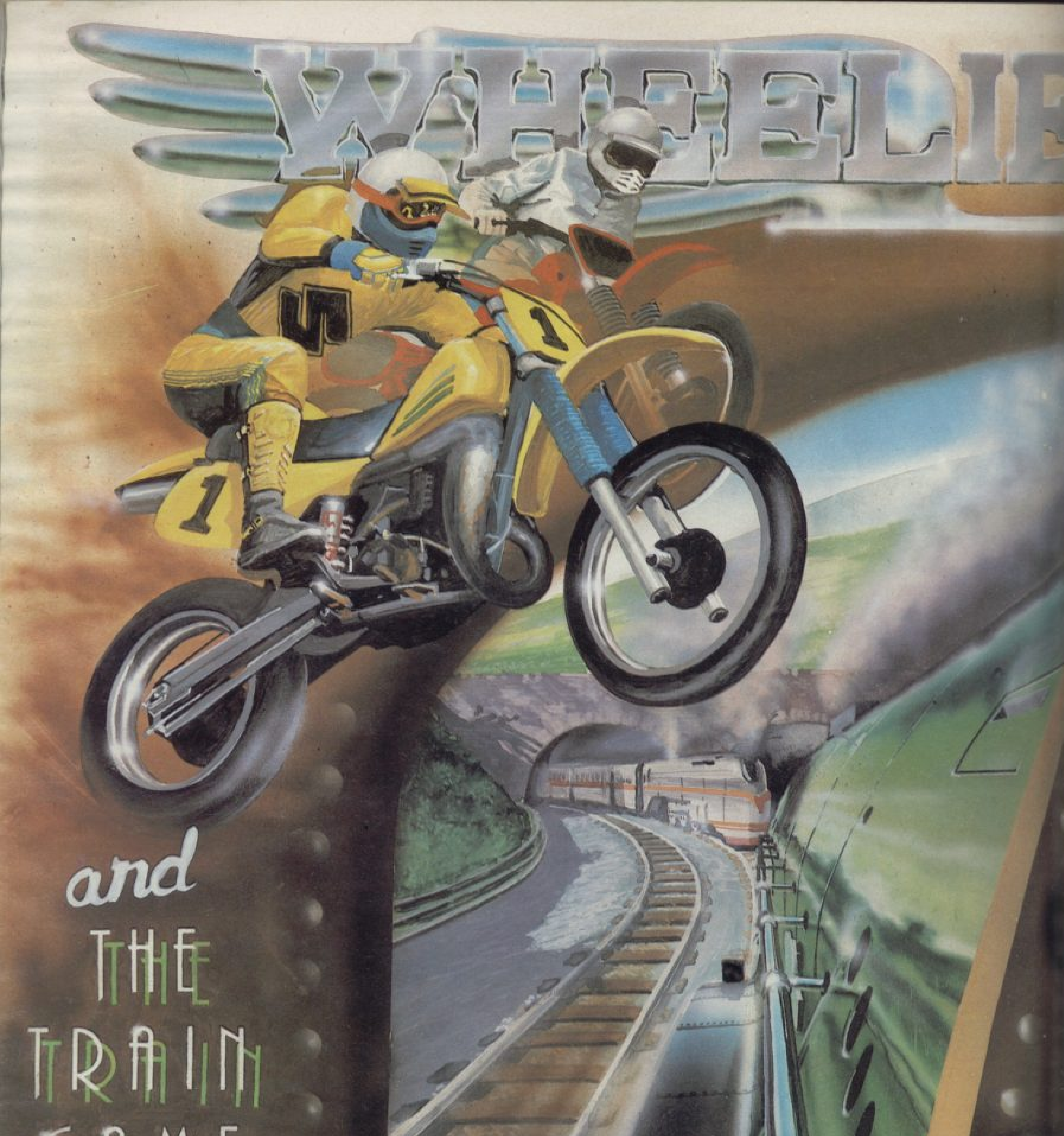
The Ket Trilogy has been acclaimed by the critics not only for its complexity and playability, but also for the finely designed world of Ket and the unique combat system, which gives a blow-by-blow description of the fighting in a style similar to that of fantasy role-playing games such as *Dungeons and Dragons.* Each game is more difficult than the previous, so inexperienced adventurers can develop their skills as the quest progresses.

THE FINAL MISSION



Seeking the evil Vran Verusbel,
I entered a noisome chamber.
Tombs lay everywhere,
but eventually I noticed
a slab of quartz.
Hidden underneath were
amethysts, many rubies, and
enormous glittering diamonds.

Hint: Disregard almost half of what you see. Alternatively, only the first is significant.


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THE TRAIN GAME
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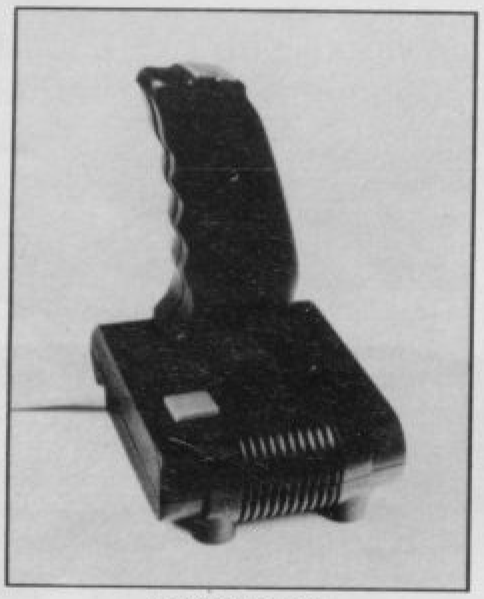
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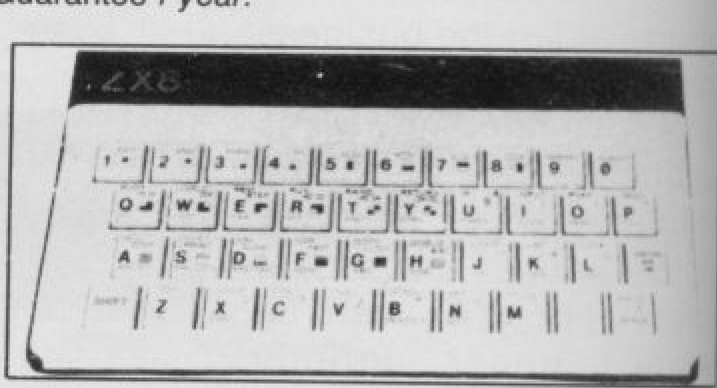
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Flying low

Chris Bourne talks to Costa Panayi, laid back pilot of TLL



IN contrast to the concept of whirling motion suggested by its name, Vortex Software is as laid-back an outfit as you are likely to find in the frenetic software industry.

The company is very much a family business. Brothers Costa and Crete Panayi handle programming and advertising respectively while brother-in-law Luke Andrews concentrates on administration and finance. Greek Cypriots by ancestry, the strong emphasis placed in Greek culture on family ties and loyalty serves the brothers well in their business enterprise.

The founder of the company was Costa, the programmer. As often happens in the industry, the other brothers were brought in later as the operation grew more professional and required their particular talents.

Costa's first introduction to programming was at the University of Salford, where he took a Fortran course as part of his degree in Mechanical Engineering. At first Costa was more interested in the machinery than the programming of computers, and wanted to buy a kit. "I fancied a UK101, but I couldn't afford it. Then the ZX-81 appeared, and as soon as I saw the ad I ordered it. I had to wait three months before it arrived."

By now Costa was working as a design engineer for British Aerospace, and a number of his colleagues at work were also excited by the new machine. "We had bets on which one would arrive first. Mine was last. There were about half a dozen of us, and we swapped programs at work."

It was on the ZX-81 that Costa learned Basic, and the first few programs he wrote were in collaboration with his friend at work, Paul Canter. They sent off their first tape to Michael Orwin, of Orwin Software. "It was a collection of programs, Mastermind, Pontoon, Othello and Awari. We were quite chuffed. You wouldn't believe it, he's still sending us money."

At the time, however, Costa had no intention of quitting design engineering, his chosen career. Besides, he was still learning how to program, teaching himself machine code from books.

"The 1K machine was really useful for learning how to be efficient. To begin with it was difficult to see how you could write games."

Costa began by writing routines instead, mainly connected with screen displays. The scrolling techniques he developed were later used in **Cosmos,** now known as **Astral Convoy.** He and Canter set up Vortex Software and decided to sell it themselves.

The timing was atrocious. Suddenly the Spectrum appeared on the scene and sales of Cosmos went flat as pitta bread. They quickly converted the game to the 16K Spectrum, including sound and colour features, and, deterred by their initial experience, licensed the game to another company.

Costa then began work on **Android One,** and it was at that time that his brother-in-law Luke became involved. "It was a natural progression for Vortex," Luke explains, who is a craft teacher. "I'd handled money working as a teacher and I used to have my own furniture-making company." Crete Panayi had already helped Costa with the advertising side, drawing on his experience working for an advertising agency and his knowledge of design.

Costa's games can easily be seen as a progression of ideas, developing concepts from game to game. The original scrolling technique developed on the ZX-81 in 1K have formed a major feature of all Vortex games, along with other ideas such as 3D effects and large playing areas. Although the original routines are no longer recognisable in the latest products, the development of the style has been a continuous process.

"For Android One we tried to produce a game with a lot of features. We used the scrolling techniques to produce a long corridor, and designed a few rooms, then tried to get something running about the screen." It seems a slap-happy technique to design a game while writing it, putting together chunks of old routine and working out the possibilities, but that is one view of the process by which Costa writes games. "We try to look at the trends" he says. The idea for **TLL** came simply from the popularity of **Flight Stimulation,** although the game bears no resemblance whatsoever to the Psion program.

Android One became a popular success, and was accepted for retail by W H Smith. The sequel, **Android Two,** takes the action further using a considerably expanded playing area. The object of the game is to move around a maze-like park destroying blue millipoids.

"I wanted to do a sequel which had something special about it. That's why

I developed the 3D effect. It was our first 48K game, and took me 9 months to write. It was released just before Christmas 1983."

Nine months is an enormous length of time to produce an arcade game, but it must be remembered that all the time Costa was still working for British Aerospace. The game itself caused problems, as the ideas Costa was putting into practice were highly ambitious.

"The game became so complex" he says. "The millipoids caused problems. Most people use dark backgrounds but we decided to use the BRIGHT colours. The other thing was the wraparound maze."

The long haul was certainly worth it. Lurid is the only word to describe those background colours—there is an almost tangible feeling of poisonous heat about the game.

"I was tempted to do **Android Three,**" says Costa laconically, threatening further horrors in his metal world of mayhem. "But I decided to leave it for another day."

"TLL is really a progression of the ideas in Android Two. I expanded on the 3D landscape, making the wraparound more complex. There is an extra dimension as the plane isn't always on the ground."

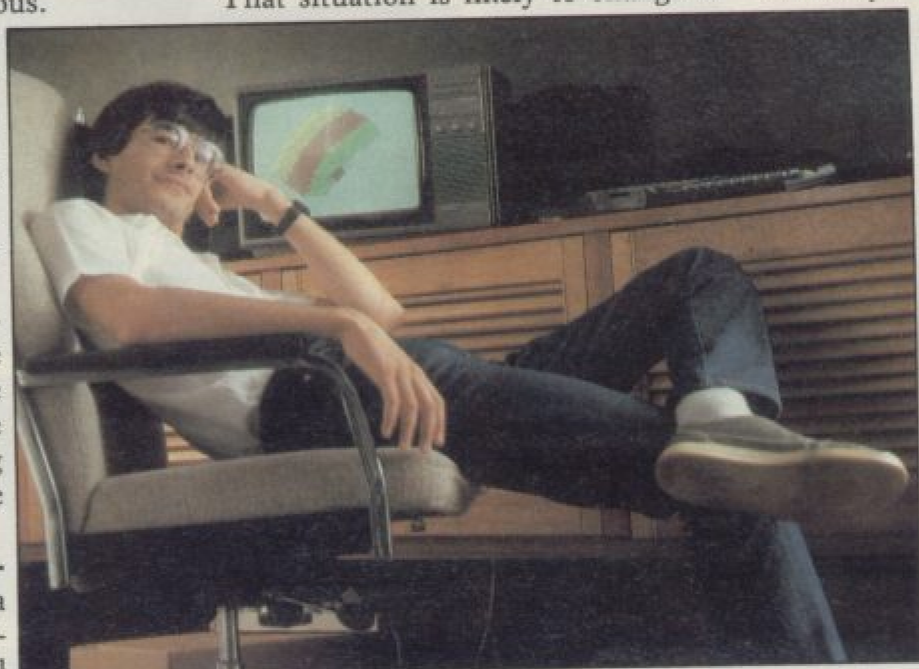
TLL was one of the big hits of the summer, with superb graphics of buildings. "It's easier to get into TLL than Android Two" suggests Luke Andrews. "My best score is 34,125. We always like to make each game something of an adventure. There is a sort of Vortex cult. For instance, we don't tell you everything about TLL on the cassette insert."

An example of that is the fact that you can fly under bridges and telephone lines in TLL, which at first simply look like obstacles to be avoided. The first time you go under the bridge the 3D aspect of the game really opens up and you see the plane duck under and out of the other side. Costa himself is particularly proud of the shadow which the plane casts. When you fly over a building the shadow climbs up the wall, which, if you think about it, means suddenly it has to move faster than the plane to keep up. "It took a bit of doing that," says Costa, smiling quietly.

The brothers are a quiet spoken trio and Luke is very sanguine about the problems suffered by the software industry of which we read so much in the computer press.

"Garages are going bust all the time" says Luke. "People don't mention that. Software houses have matured a great deal, but we still regard ourselves as beginning. If we haven't got the money for something then we don't do it. We haven't drawn a penny out of the account yet for ourselves."

That situation is likely to change in



the near future as the company plans to move into a real office—at present it still operates from the front room of Luke's house in a leafy Manchester suburb. Costa left British Aerospace earlier in the summer to devote himself full-time to programming, and thus will require a living from the business.

Vortex has appeared to be happily isolated from some of the problems faced by other companies, partly because of its policy of never borrowing money, and partly because it has released so few titles and yet managed to sustain a loyal following. "We can't be doing too badly" says Luke. "People tell us we're in a slump. Yet in this depressed period TLL has consistently been in the top five since its release. Too many people say it's a seasonal thing, but people still want software in the summer."

If Vortex as a business takes few risks and aims for consistency of quality rather than a high profile and a galaxy of quick-money instant games, Costa himself takes risks of a different kind. "A guy at work in his early sixties did a parachute jump and then put up a notice daring everybody else to copy Granddad," he explains.

Costa and a group of friends went to Langer Airfield in Nottinghamshire, home of the British Parachute School, to try their hand. "The first jump was over a weekend, you get a day's training and then you do your jump on the Sunday. Once that's done you try to get as many as you can in order to be able to go freefall."

"I've never seen him so enthusiastic about anything before" says Luke. "It's a fantastic sensation" says Costa, and goes into reveries about the joy of jumping out of aeroplanes. Wasn't it just a bit scary? "The night before the first jump was worse" says Costa. "But once you've got your kit on you don't think about it."

Costa is unlikely to be getting much time for parachuting over the next few weeks, as he is busy working on the new game, **Cyclone.** The promised move to a new office will therefore be delayed until the game is completed, so it is likely to be one of the last programs Costa writes by himself, as the new plans include creating a design team to work around him, producing two or three games a year for arange of machines. That may seem a small quantity, but it is more than Vortex has been producing over the past three years.

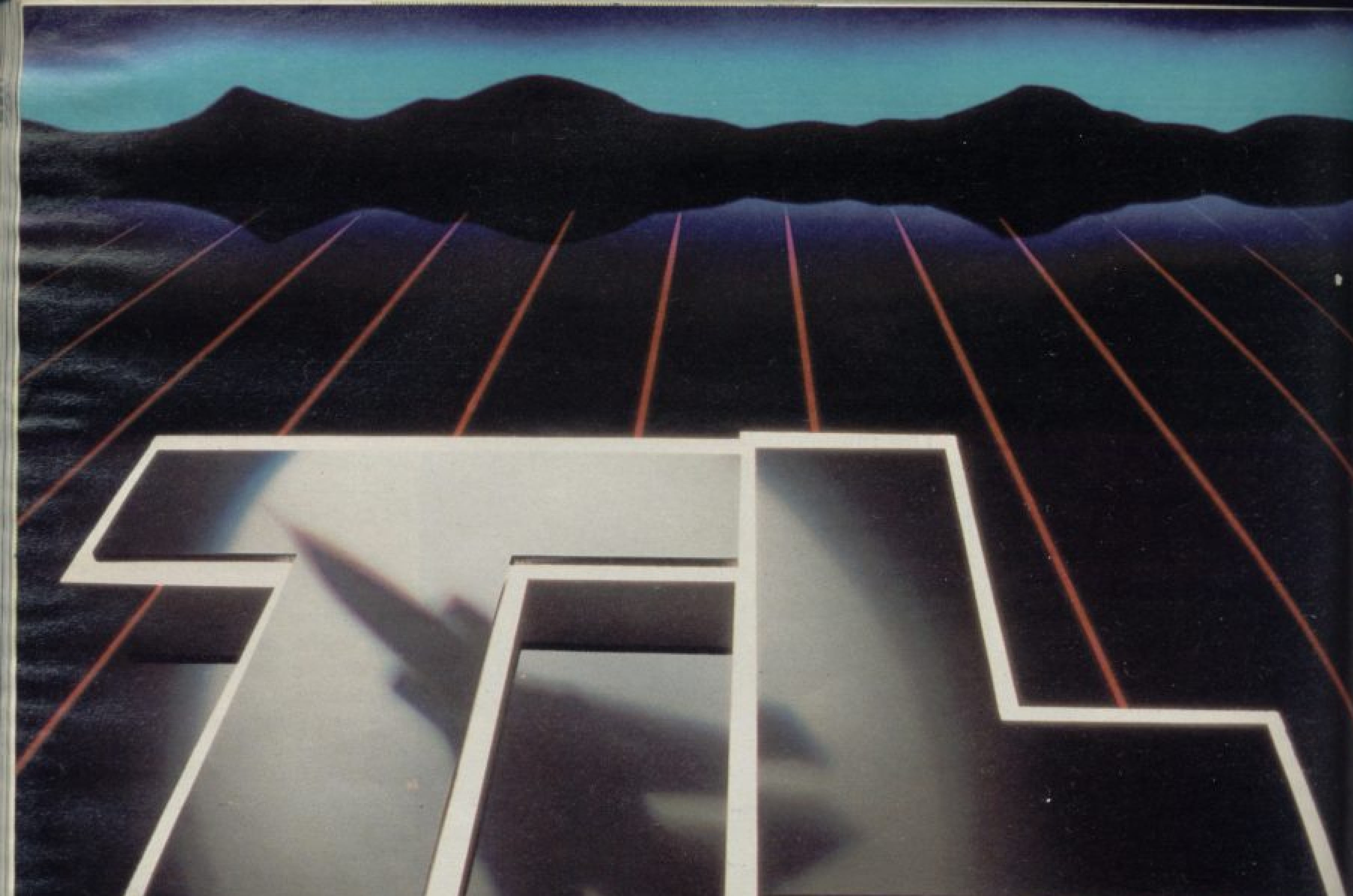
The way the games are created, with nobody at all sure what Costa's final version is going to involve until it happens, means that the team is understandably reticent about describing Cyclone. Luke explains that even the advertising causes problems, as they genuinely do not know what the game will include when the advertisements have to be placed. Hence the mysterious shadowy Tornado in the TLL ads, about the only thing that was certain about the game at the time.

Cyclone however will be another flying game, but with a much bigger playing area than TLL.

"Watch out for innovations" says Luke, mysteriously. "I can guarantee that. And the weather will play a central part."

Jim Bacon meets the space pirates? Michael Fish versus Pacman? At any rate, the game is due to be released at the end of October, and Vortex is certainly looking for a Christmas hit with Cyclone.

It seems that while the gales blow around them, and other businesses rock and even crumble under the force of 'natural market pressures', Vortex stays cool — the calm spot at the centre of the whirlwind.


IF ANDROID TWO
MADE THE CRITICS RAVE,
T.L.L. WILL GIVE THEM
HYPERMANIA.


COMING SOON...
GOOD GRIEF! WE'RE NOW IN THE BLACK FOREST CHATEAU
MMMM... AND WE'RE ALSO IN DOUBLE TROUBLE
DANGER MOUSE
Two great new games from
CREATIVE SPARKS

Paint pictures on your television screen

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GET THE MOLE
BEFORE HE GETS YOU.

Raiders of an ancient art

In the first of a regular series Richard Price examines the history of role-playing and the development of micro adventure games



IT IS NEAR DAWN with only the hum of the transformer and the glare of the TV screen to keep you company. Dog-tired, bleary-eyed and suffering from severe back and brain strain you desperately try to escape a band of roving cannibal orcs amongst the dungeons of a menacing fortress. Your computer is overheating and it seems like a week since you last slept but you cannot give up now. You want to be a hero and the real world can just wait until you have managed it.

Recognise yourself? If you do, then you know you are an adventure addict, hopelessly hooked on the multiplicity of fantasy worlds that the computer can offer for exploration. That jumble of wiring and chips can transport you into the far future aboard a giant spaceship or to medieval worlds where magic and myth rule.

To survive in those places you will need a crossword puzzler's mind and be able to solve complex logical problems by a mixture of luck, cunning, planning and lateral thinking. Computerised brute force will come in handy too when your luck dribbles away and you are face to face with some fire-belching dragon.

It is easy to think that computer technology has made all that possible but there is more to it than just the machine. Mazes, and the symbolic hazardous journey through them, have had a powerful fascination for the human mind for many thousands of years.

At Tintagel in Cornwall, bronze age tribesmen hammered intricate labyrinth patterns into the rocks, perhaps as some mystical depiction of the soul's wanderings from birth to death and back again. Before them the first farmers decorated the huge stones of their communal tombs with swirls of interlocking lines and spirals. Dancing mazes cut into the turf still survive in a few places around the country and, all over the world, there are myths and legends of heroes and heroines overcoming the terrors of the labyrinth or other subterranean places to emerge powerful, fulfilled and triumphant.

Almost all those stories portray a human character facing intolerable danger in threatening places, often lost, often afraid, but succeeding through his or her wit and persistance. Maybe the ordinary, small person has always needed such fantasies as a welcome escape from the humdrum reality of everyday life. With the machine's help it is now possible to enter the unknown and make your own decisions about how the story should develop. No longer a passive listener or spectator, you can become Theseus, Bilbo Baggins or Sherlock Holmes for a day and still get back in time for your beans on toast.

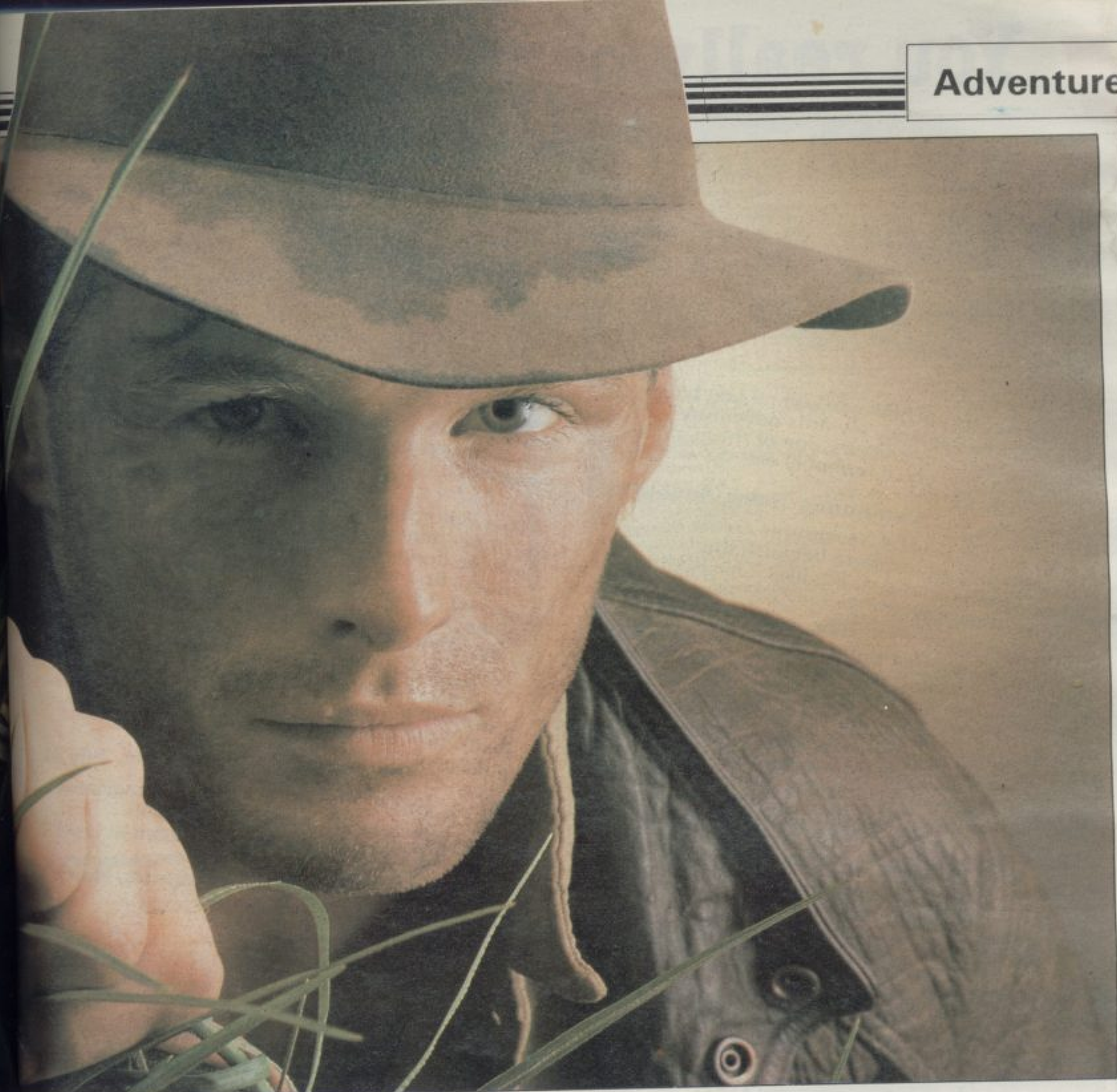
Most people would accept that JRR Tolkien is the father of modern fantasy writing and his plots and terminology run through many of the games that use magical or heroic worlds as their setting. His themes, combined with war-gaming rules, were adapted by Gary Gygax and Dave Arneson as the basis of their role-playing game *Dungeons and Dragons.* In that system a Dungeonmaster designs a complex of caves peopled by monsters, treasure and magicians. Through that place, a party of adventurers will journey. Each of them must take on a character and act out their role in as 'real' a way as possible. The more consistent and inventive the setting, the more pleasure, excitement and satisfaction for the player.

There are now many variants on the original concept, from outer space to Middle Earth, but they all expect the player to do more than just chop up monsters and often demand problem-solving skills and ingenuity. Role-playing games have a vast and dedicated following and their devotees can sometimes seem like members of an esoteric religious cult. Psychologists would claim that the game helps young people to work out their personal problems through safe fantasy.

Absorbing as RPGs are they suffer from a major disadvantage. Creating a dungeon is a painstaking business and the play itself needs the concentrated attention of up to five players all of whom must be willing and able to give up several days, or longer, to their hobby.

That means that a lot of organisation is needed to make a session work well even if you can drum up the group of adventurers. The action itself can also be slow as there are numerous die rolls and consultations with rule books to interrupt the flow of play.

Two computer programmers, Crowther and Woods, translated that sort of single role-playing into computer language and plumbed it into their mainframe. Computer text adventure began with them in the not so remote past of the early seventies. Their original **Adventure** featured a Tolkienesque plot set in a twisting labyrinth with



lots of tricky puzzles and mean monsters. Once Sinclair had pioneered the home computer the field was open for rapid development of the art.

Computer text adventure comes in all shapes, sizes and eras but there are fairly standard features which define the genre. The interpreter must be able to understand some basic English, often just a verb/noun combination and also carry a set of built-in commands and requests, such as Help, Inventory or Score.

Good programs will always possess a varied concealed vocabulary for the player to discover by trial and error. Getting the right words for the right action is one of the trickiest problems in adventure, especially where magic is involved.

Informative location descriptions and a versatile response from the interpreter are very important as they help to set the scene and make the player feel that the computer has a personality, just like the old Dungeonmaster. Most players would also expect the locations to be properly connected so that a map can be made.

Above all else the theme and the setting ought to be internally consistent. If you are exploring a world where magic is possible then that magic should follow its own rules and not be the excuse for a failure of the writer's imagination. It is also off-putting to wander through some heroic medieval landscape and discover an inn with pool tables or similar oddities. Too many unsuccessful programs hurl a jumble of different eras and technologies together.

The arrival of the Spectrum, with its large memory and graphics capability has inevitably meant that adventure programming has become more and more sophisticated and there are many variations on the format currently available. The purists probably will still argue that text-only adventures are the real thing as they don't waste valuable space on pretty pictures and are often good value for money, tending to have more locations and better descriptions.

Level 9 produces a range of text games that are inventive, involved and usually large. If you're keen to try out a version of the original mainframe Adventure its **Colossal Adventure** has a lot of similarities but has more locations and a slightly altered set of problems. Other games by the same company carry on from where that game stops.

Level 9 takes a lot of trouble over the plots and settings of its programs and, if you are after an adventure with a difference take a look at **Snowball.** You will find yourself in a vast interstellar spaceship that has gone out of control. While swarms of colonists hibernate in blissful ignorance of the danger you must explore the ship and find the main con-

continued on page 150

continued from page 147

trols. Guard robots menace you and the sheer vastness of the vessel means that your task will be long and involved. The technology is very carefully constructed and the design is extremely convincing with over 7000 locations.

If you would rather be a classic, albeit reluctant, hero, the **Ket Trilogy** from Incentive Software provides all the magic and mayhem you will need. **Mountains of Ket** and **Temple of Vran** feature mad sorcerers, battle-crazed orcs and combat routines which help to bridge the games nearer to their D&D ancestors. It is also satisfying that the story continues from one program to the next. The world of Ket is consistent and exciting and is well worth a visit.

Adventures using graphics, either to illustrate locations or to show the action itself, seem to be becoming the norm. Games, however, like **Atic Atac** or **Halls of the Things** are not in that class. Those so-called graphic adventures are little more than glorified arcade games and do not have the features that define proper adventures, exciting and accomplished though they are.

It would be difficult to discuss text adventure without mentioning **The Hobbit** from Melbourne House. That program has set a standard for future adventures with its use of nearly English 'Inglish' and interactive characters who live their own lives while you are busy trying to get out of the goblin's dungeon. A vast range of input is allowed and the variations of possible actions make it seem like ten games rolled into one, though some may find the routine of talking to characters rather tedious at times.

After The Hobbit programmers looked for more and more innovation. **Valhalla** combined animated cartoon-style graphics with a versatile text interpreter and has shown the huge potential of the Spectrum. Despite some flaws — like the occasional crash — the game is open to a number of uses. You can follow the quests if you like or develop your character independently, choosing to be evil or good as the mood takes you. The other inhabitants will respond convincingly to the role you take on and they too will go about their own lives, which of course you can sit back and watch if you do not feel like joining in.

Lords of Midnight from Beyond does not quite fit the adventure description. That immense game with its 3D static graphics, multiple leading characters and strategic planning uses an adventure plot mixed in with wargaming concepts. Armies and allies have to be recruited to defend the world against Doomdark, a Sauron-like sorcerer. The four major characters are guided through the meticulously detailed landscape by the player and there are various ways of defeating the powers of evil. The program is very reminiscent of *The Lord of the Rings* in its theme and you can make the story what you will.

The best adventures are those where a true multiple choice is involved. It is easy to spot a poor program by the linear nature of the action — only one entry is correct and you cannot proceed unless you do exactly what the programmer has put in. In most of the games mentioned there is a reasonable freedom of choice. Remember though — freedom of choice may mean you will find yourself up the creek later on. A bit like real life, in that respect, and that for many is the entertainment in adventure. You will learn from your mistakes, load your saved position and wearily start all over again, but still get a lot of fun and excitement in the process.

The mysteries of adventures can baffle even the greatest hero or mage at times. If you are having trouble on your travels or have hints and tips to offer fellow explorers we would like to hear from you. Scribe your letter to Richard Price c/o Sinclair User, EMAP Business and Computer Publications, 67 Clerkenwell Road, London EC1R 5BH.

Mindstorming

Theo Wood talks turtle at the Logo Conference and listens to blunt-speaking guru Seymour Papert

LOGO USERS are a special breed of enthusiasts; not only are they deeply involved with the computer language Logo, but they attend a weekend conference discussing it. The British Logo Users Group held its annual conference at Loughborough University at the beginning of September. Conferences are rather like exhibitions where everyone who shares a like interest can see both hardware and software and catch up with all the latest developments. Conferences are also the venue in which much discussion can take place as to the relative merits of the goods on offer, and an opportunity to hear experts expound their views in greater detail.

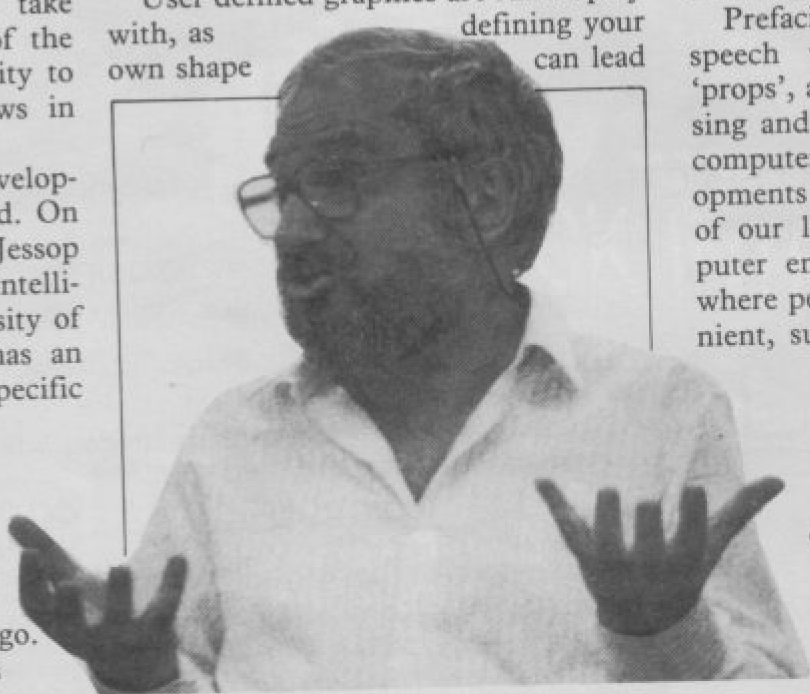
There are some exciting developments afoot in the hardware field. On show was the radio controlled Jessop turtle, developed at the Artificial Intelligence Department at the University of Edinburgh. The Para version has an interface which will operate on specific computers; that means a version is available for the Spectrum.

The radio control module will fit into the user port enabling the turtle to be controlled through Spectrum Logo. There is no problem with cables getting in a twist as the turtle moves around, and that is an obvious advantage. The Jessop turtle, looking like a transparent dome full of chips, was dressed in a motley array of outfits to make it look like a turtle, with head, legs and arms sticking out, reminiscent of Auntie Dot's yearly offering for the school jumble sale.

The Valiant Turtle accomplishes the feat of remote control by infrared and has a plastic body and eyes which glow. That will also interface with the Spectrum and be controlled by Logo. Prices of both these products are, however, almost certainly beyond the pocket of home users as neither would leave any change out of £200.

Of more interest to the home user is Zero 2, a clever little robotic device which will plug into Spectrums fitted with an RS232C interface. That will operate directly with Spectrum Logo. The basic model has three stepper motors, two leds, a two tone horn and a line follower. It includes a pen kit for drawing via Logo commands either on the floor or table. A kit form can be bought for as little as £79.95 or built for £99.95. With an eye presumably on the Christmas market, there is a strong possibility of a package bundling Zero 2 with Sinclair Logo for about £120. One has to hope that the device will live up to its specification especially in terms of resolution, supposedly better than 1mm and 1 degree.

User defined graphics are fun to play with, as defining your own shape can lead to great possibilities when writing games programs. Nevertheless they can be rather tedious and time consuming, with the added disadvantage that the BIN statements have to be typed in very carefully. There then follows the problem of making them move. The results are not always fast enough in Basic and require machine code routines to make them work at the desired speed.



Evangelist Seymour Papert.

The Spectrum sprite board is the answer to all those dreams of fast on-screen action without the sweat. Fitting into the user port of the Spectrum the sprite board provides 32 independently programmable sprites which can move in any direction all at the same time. The sprites will be programmable either from Basic or Logo. By using the second option in particular, animation is within the reach of far more people than before.

Marketed by Logotron, the Spectrum sprite board will be available at a price of £129.95, but as with all new technology one would expect the price to fall as production gets into gear.

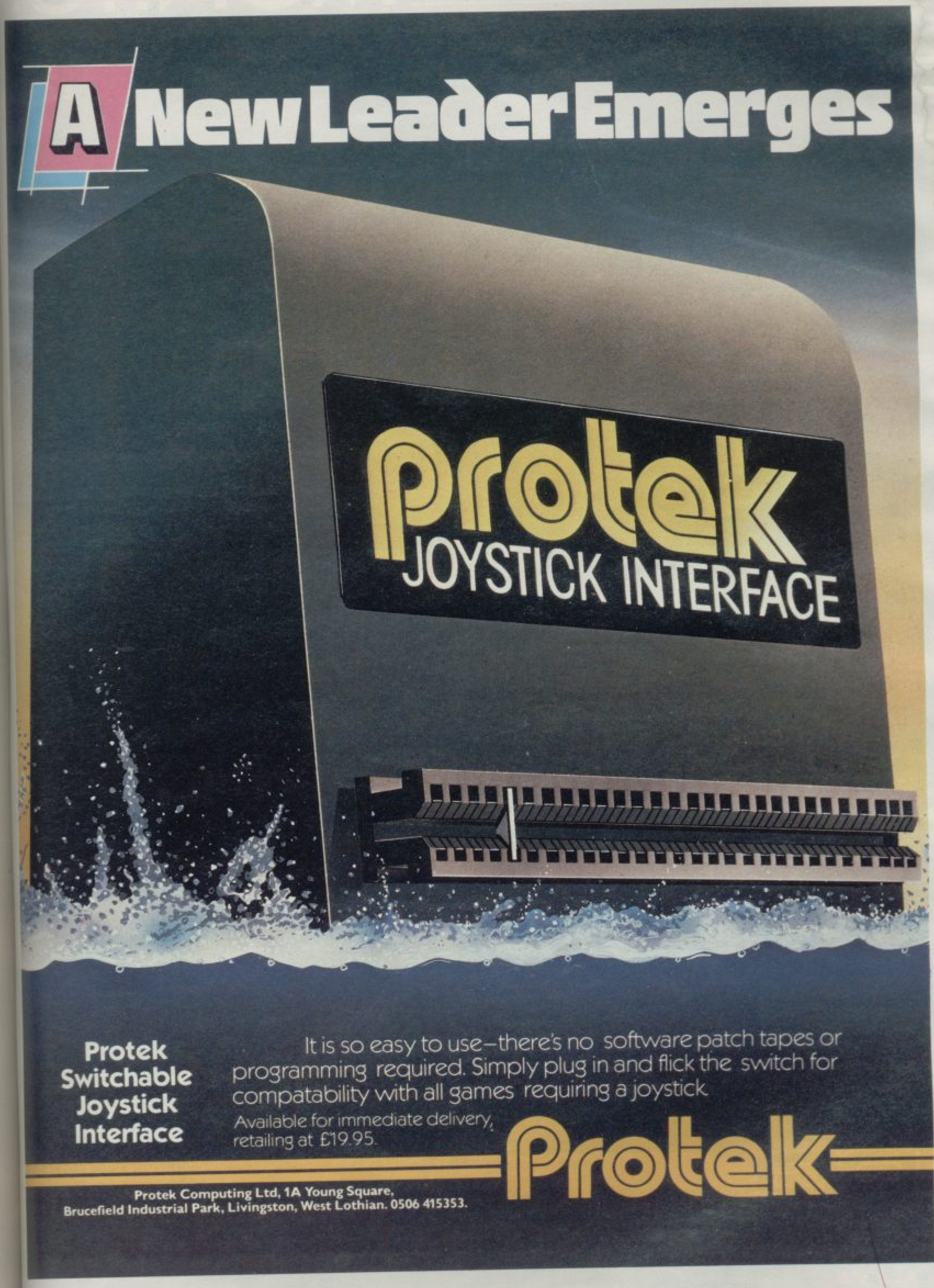
Sprites were one of the main topics covered by Seymour Papert in his presidential address to the conference. Papert is the guru of the Logo movement, because not only did he and his team develop the language, but his book *Mindstorms* is the Bible of Logo enthusiasts. He is also a very witty and amusing speaker.

Prefacing the main section of his speech with demonstrations of his 'props', a camera with automatic focussing and his impressive NEC portable computer, he explained how new developments in technology enter the fabric of our lives. Thus the portable computer enables him to write in places where pen and paper are most inconvenient, such as in taxis, but it also becomes 'his' in a way no desktop computer could.

Papert is a somewhat blunt speaker; anyone who makes statements such as "Newton's Laws of Motion are horrible" must strike a chord with all those who have to study them in their school career. Motion is everywhere in our lives yet the laws which cover it are not immediately accessible and are expressed with reference to a particle, an abstraction. With sprites it is possible to explore the world of movement, just as Logo and the microworld of turtle graphics enable users to explore geometry in a concrete way.

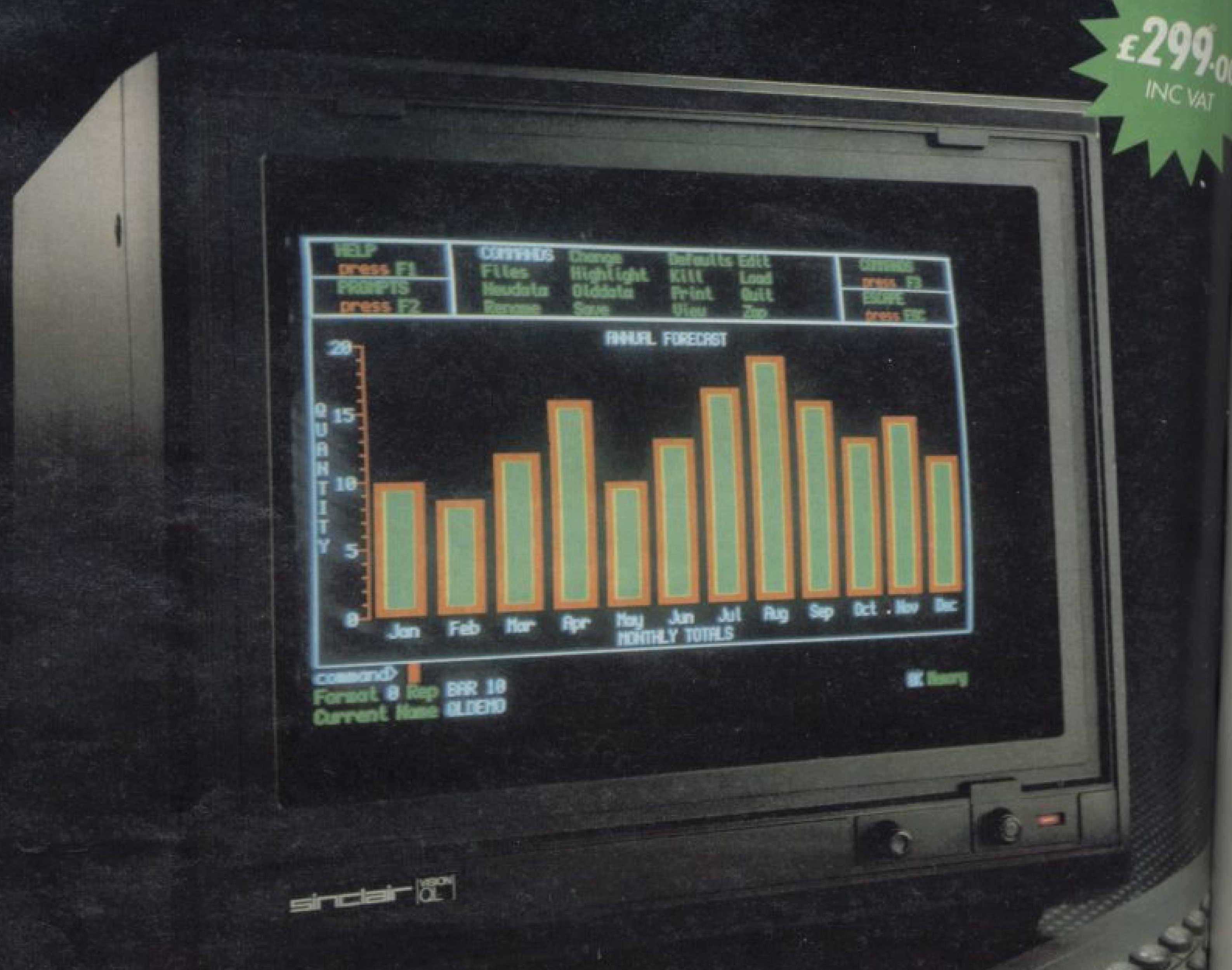
As an evangelist Papert is bound to have his critics, and some delegates could be heard muttering sceptical comments about his claims for Logo. Yuri Leon, from the Haifa Institute of Technology, pleaded for moderation in the claims made for Logo, otherwise the situation may backfire, and many people would be disappointed.

Jessop Electronics Ltd, Unit 5, 7, Long Street, London E2 8HN. Turtle Price £170 + VAT.
Valiant Designs Ltd, Park House, 140 Battersea Park Road, London SW11 4NB. Turtle price £199 + VAT.
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Contents

Mike Wright reviews the latest microdrive software overleaf and on page 163 antique dealer Alan Proctors shares his programming experiences.

SINCLAIR BUSINESS USER

November 1984

A long four years

THANK YOU for finding the time and space to review my **Building Price** program in the September issue.

I am pleased to see at last a start made with your *Sinclair Business User* to fill the need created by the ZX-81, Spectrum, and QL. It has been a long four years, for the few who took the plunge with the first ZX-81, waiting for the rest of the small businessmen and women to realize the benefit of the Sinclair computer and its future in the small business. In fact, the smaller the business the more the computer can help, as very often, especially in the building industry, the proprietor has to work on site and do the office work as well. I wonder how many fathers who have given their children a computer, try to do their office work in the evening, to the strains of **Jet Set Willy's** *If I was a rich man*.

The Building Price program has been in regular use for the last year and copes with most plans; I have just put through a plan for a small extension in less than 10 minutes. I have a microdrive which is a joy to use — it took me two years to write the program and it can load in nine seconds.

Long may you continue to support us Sinclair Business Users with your excellent magazine.

John Redman,
Axbridge, Somerset.

Record software

I SHOULD be interested to hear from anyone who is using one or more of the business programs on the market for the 48K Spectrum for running a small retail music tape/record business.

Postage and incidental expenses would be reimbursed.

E Robinson,
Record & Tape Centre,
6 Main Street,
Cockermouth,
Cumbria.

Printing space

IN DUE COURSE I would like to set the copy for a monthly newsletter using a micro-computer and a proportional daisy wheel printer.

Presumably, to do that I would need a word processing package that will show the effect of proportional spacing on the display screen — especially if columns are to be correctly justified. Is it possible to work in that way on the Spectrum or the QL, or indeed on any other popular micro?

Charles Lane,
London W1N

● *Proportional spacing is possible on most word processors. For the Spectrum* **Tasword 2** *is the best and the QL is supplied with* **Quill.** *That is all you will need as the software produces the format of a document and not the printer.*

Shop window

IN AN EARLIER issue of *Sinclair Business User* we asked for details of specialist programs of limited commercial value written by readers which might be of interest to other serious users. Details of programs will appear once only within *Sinclair Business User.* If readers would like details of their programs to appear regularly they can advertise in Sinclair Supermart at the back of the magazine.

Blackboard. Stores and solves equations without requiring any programming. It can contain 255 equations of up to 10 variables each. From VJB Software, 33 Merton Street, Bury, Greater Manchester BL8 1AW. Price £3.00 including p & p.

Building Price. Calculates the cost of constructing buildings and extensions, drawing a plan of the building after measurements have been entered. Contains more than 100K on two cassettes, price £15.00. Available from J Redman, Stevelon House, Slade Lane, Tarnock, Axbridge, Somerset BS26 2SH. Tel. Edingworth 518.

Calendar. Converts dates from Gregorian (European) to the Hegira (Islamic) calendar systems. Runs on 48K Spectrum, microdrive compatible, drives full-size or ZX printer. For further information contact E J F Austin, BAC Ltd, PO Box 2, Tabuk, Saudi Arabia.

D J Words. Versatile word processing program for 48K Spectrum with microdrive. Capable of 137 character per line in condensed mode. Enlarged, condensed, underlined, emphasized and italics modes available, as are tabulation, centralised and right justified print position and left margin changes. Fast text editing facilities. Priced at £13.80 including p & p, from D J Programs, Lawnspeedie, North Duffield, Selby, N Yorkshire. Tel (075 785) 615. A range of computer programs for farmers also available.

School Fund, Class List. A rang of administrative programs for teachers, as well as educational and business software. For further information contact P Nethercot, 2 Chantry Close, Sunderland SR3 2SL.

Mike Wright reviews two products which explore the business potential of the Spectrum

Microdrive pioneers

MORE AND MORE business programs are, at last, advertising microdrive compatibility as a feature. Transform and Hestacrest are both companies which have released programs which go further and require not one but two microdrives.

Invoicing/Accounting from Transform is designed for a 48K Spectrum fitted with twin microdrives and an 80 column printer. It costs £25.00 — or £15.00 for owners of the present Invoicing program — and it bravely attempts to provide all the features of large business systems.

Somewhat strangely, it seems at first, the suite is supplied in a large plastic book type case containing two cassette tapes. The programs must be loaded from tape, customised for the user's interface and saved to microdrive. The infamous problems encountered with microdrive cartridge compatibility, where programs saved on one microdrive will not always run on another, have been a factor in Transform choosing to release the programs on cassettes, one for the ledger and one for the invoicing program, rather than on microdrive cartridges. On one side is a version for a Tasman interface. A version for other interfaces is on the other side.

The customised ledger and invoicing programs are saved onto different cartridges with a third being used for the shared data. When back-up copies of programs and data are made six cartridges are needed.

One feature is the inclusion of **Taswide** to give a 64 column screen display. Once copies of the programs have been made the data can be set up. The Accounts cartridge is placed in drive one and the data cartridge in drive two.

You select option D at first from the main menu to set the date which is printed on statements. That can be entered in any format required. Option U is used to enter details of the accounts on the first run and to add new accounts in later runs. A flashing cursor is used to guide the user in setting up the account. The first input is an account name of up to 10 characters, although referred to as an account number. Next the name and address are entered and finally details of debits and credits — marked with a minus sign.

Once the details have been entered they are saved on drive two. When the data has been saved the option of making a back-up copy by replacing the data cartridge with another is given before returning to the main menu. The original data cartridge can then be replaced and a second account set up. Although it is safer to make the back-up copy at each stage you might find it more convenient when setting up accounts to enter the next account, then make a back-up copy of the whole cartridge once all accounts have been entered.

An account is updated by first loading it into memory using the save and load option then the load account option G of the save menu followed by Y to confirm the choice, before entering the account name.

Once an account has been loaded the screen shows the account reference, the name and address and a delivery name and address together with the last ten items on the account. An abbreviated menu is displayed at the bottom of the screen. Two lines of text can be printed on statements. Other options allow address labels to be added, the delivery address or statement cleared. Statements, address labels, delivery labels and remittance notes can be printed.

The invoicing program is used to set up and print invoices. The details from the invoice can be added to the accounts data at the push of a button and it is that feature which makes the programs an excellent buy for the business user. The invoicing program is loaded from the accounts program by replacing the accounts cartridge with the invoice cartridge and selecting option Q in the save menu. The invoicing program will usually be run first and the data transferred to the accounts program. Once loaded the main menu is displayed, offering you options, among others, to change the VAT rate, add items to the price list and print that price list.

Your name and address, up to seven lines of 64 characters, and a price list of up to 200 items can be used in the



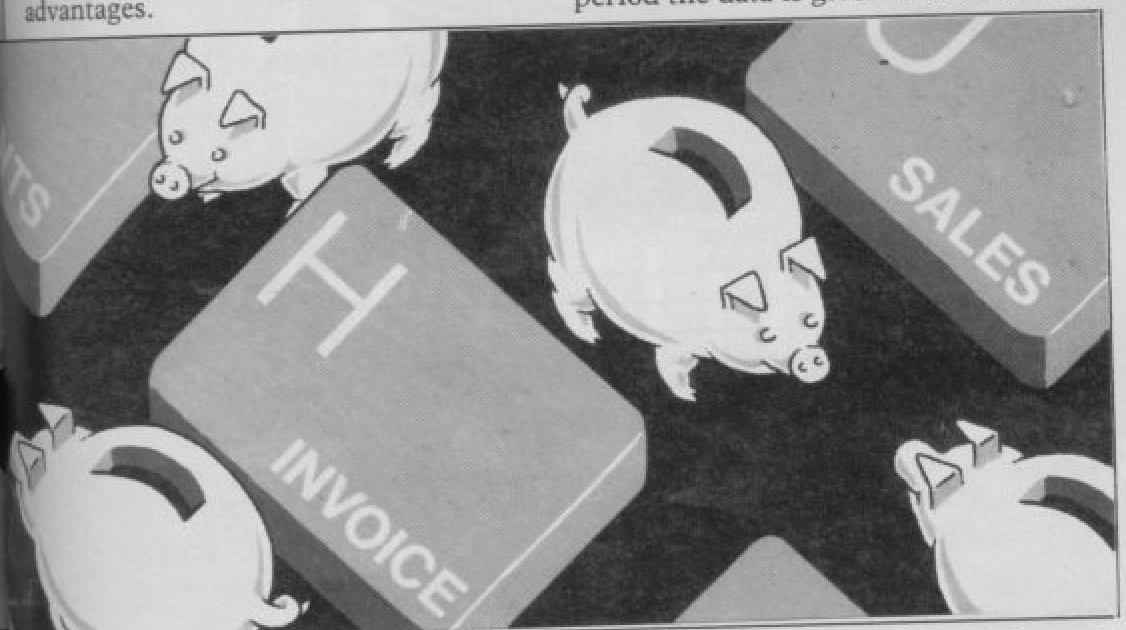
program. Each item is given a description and a VAT exclusive price. VAT at 15 per cent is calculated, added onto the price, and displayed.

An abbreviated menu is displayed at the bottom of the invoice. A flashing cursor prompts for entries to be made. The account reference is first. If an account has already been set up then the addresses are added automatically. The date, invoice number and a reference are entered next. Then the items are added, the quantity being entered first. Details and unit price are added either by typing or by entering the price list number. The cost is calculated and displayed. Entering 't' as a quantity calculates the total cost of the items. Details of postage, any discount, settlement discount and the VAT rate are added. Only one VAT rate can be used per invoice which could be a problem if your business deals in goods or services

which have different rates.

Finally, up to two lines of text can be printed at the bottom of the invoice. Those lines must be added, even as blanks, before the invoice is printed correctly with the discounts and VAT shown. Other options allow credit notes, orders or addresses to be typed, changes made to the invoice and there is even an option to clear all or parts of it. The invoice, address label and delivery label can all be printed from the invoice menu. The invoice details are added to the accounts data through option X. A warning is given if the data has not been added to the accounts.

Throughout the system the layout of the display and printouts is extremely clear and well-designed. That helps make the programs effective in speeding up the production of invoices and the accompanying accounts. Despite that, however, the programs have some disadvantages.



The first drawback is the number of microdrive cartridges needed if back-up copies — a necessity for business users – are to be made. It would be nice to see both programs on one cartridge. For some applications the lack of a sales analysis could also prove annoying. An update has been released that allows the sum of all accounts to be produced.

Sales Ledger for the 48K Spectrum, from Hestacrest Business Software, forms part of an accounting package which also includes a cash book and nominal ledger, each priced at £32.50 or £72.00 for all three. In contrast with the Transform software, Sales Ledger is supplied on microdrive cartridge.

The program supports full size printers with Centronics or RS232 interfaces as well as producing abbreviated printouts on a ZX printer. With a Centronics interface the driver software must first be loaded before the program is run from drive one; a data cartridge is placed in drive 2.

On the first run the program is set up by prompting for your name and address, your security password, up to six different VAT rates and the type of interface to be used. Giving cash discounts and linking to the other programs are also catered for. On subsequent runs only your password is asked for and whether you are starting a new accounting period; if you are then the details of the last period's transactions are cleared from the data cartridge.

You can handle up to 50 sales analysis codes of 10 characters and 250 customers. Transactions are defined in four categories — invoices, credit notes, journals and cash (including discounts) — and are all entered from a subsidiary menu. Each time you select a transaction menu option in an accounting period the data is given a batch number; up to 40 batches and 1,000 transactions can be dealt with in any one period. Individual transactions of up to £100,000 and a total of £1 million can be handled.

When entering invoices and credit notes you are prompted for the customer's code number, a reference number, the analysis code, the amount excluding VAT and confirmation of the VAT amount. VAT is calculated from the first digit of the reference code which corresponds to a VAT code. A REF LOCK option, which repeats the customer code and reference number leaving you to enter the analysis code and amount, helps reduce typing.

Opening balances are entered using the input journal option of the transaction menu. That prompts you for the account code and amount. Cash transactions can be input either from the keyboard or by links to the cash book.

At the end of an accounting period an option allows you to print the daybook, cash listing, journal listing, account statements, lists of debtors and customer address labels. Printing the daybook on an 80-column printer, will give you the customer name, account number, reference, item code, net and total amounts and the item description. On a ZX printer only the account number, item code, net and VAT amounts can be obtained.

The statements and debtors option of the period end menu allows statements to be displayed or printed, and a list of debtors with debts can be printed also. Your own or the customer's version of statements, headed with your name and address, can be printed too, showing the type of transaction, a reference, debit or credit and opening and closing balances.

You must use the end of run option before removing the cartridges from the microdrives. That updates the sales data cartridge and once it has been updated the program must be replaced in drive one with a third cartridge. That is formatted before an updated copy of the data, is made.

The program is very user-friendly after you overcome your initial irritation at loading the interface software every time and using the full load command instead of a run file. The ability to fix VAT rates individually is very useful as are the sales and VAT analyses. The printouts are clear enough although you might find them clumsy.

Both the Transform and the Hestacrest programs can be seen as another step forward in the drive to show that the Spectrum can be used very effectively in business, and although both have weaknesses whether or not those matter will depend on your requirements. They are the first programs to use microdrives as if they were disks. Other companies must surely follow when they see what can be achieved.

Transform Ltd 41 Keats House, Porchester Mead, Beckenham, Kent. Tel: 01-658 1661.

Hestacrest Business Software PO Box 19, Leighton Buzzard, Beds. LU7 0DG. Tel: 052-523 7785.

INVOICING/ACCOUNTING
Memory: **48K**
Price: **£25.00**
Gilbert Factor: **8**

SALES LEDGER
Memory: **48K**
Price: **£32.00**
Gilbert Factor: **8**

Cashflow problems? Kuma attempts to find the answer

Domestic finances

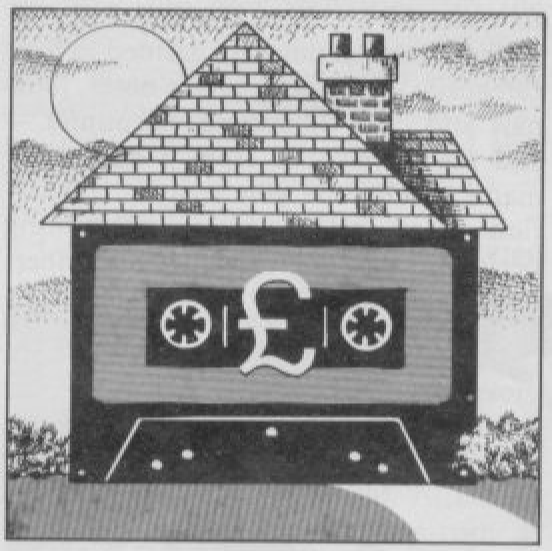
HOME BUDGET from Kuma Computers is intended to help you plan your finances. The program is cassette based and has no manual or written instructions. Instead, a series of Help pages are included in the program.

You keep track of your finances by defining a 'year' and entering income and expenditure for each month. The amount entered can be a forecast to be updated later. Expenditure can be entered as one of 10 user-redefinable categories. On the first run the program eases the entry for each month by prompts. Entries can be changed using the back-up option which permits you to re-enter a previous entry.

Option 1 on the main menu allows you to add data or create a new file. It also has a special rolling budget feature which allows new files to be created using the existing data.

Entries for a particular month are displayed using option 2, which also shows the following month's data. The results for any category can be displayed as a three-dimensional bar chart. Those allow you to define the vertical scale and they do look impressive. The effect, however, is lost when a chart is printed. A printout can be obtained from any of the display options by pressing P.

When the file is saved a six figure security code appears which must be re-entered when the data is loaded.



Though Home Budget is easy to use it cannot be described as user-friendly. The Help pages, which are a great idea, are not effective and the overall lack of instructions is disappointing. That is characterised by the back-up option, which does not make a spare copy but moves back one entry, which is not explained.

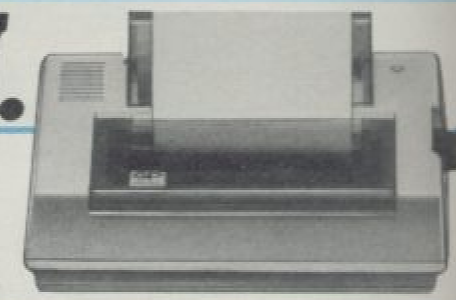
You will probably find the biggest obstacle to using the program lies in the fact that monthly totals of expenditure have to be entered. Since such information is not usually kept in that form a separate program such as **Finance Manager** may be needed to get category totals first.

Kuma Computers Ltd Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks. RG8 7JW. Tel: 07357 4335.

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Memory: **48K**
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Gilbert Factor: **5**


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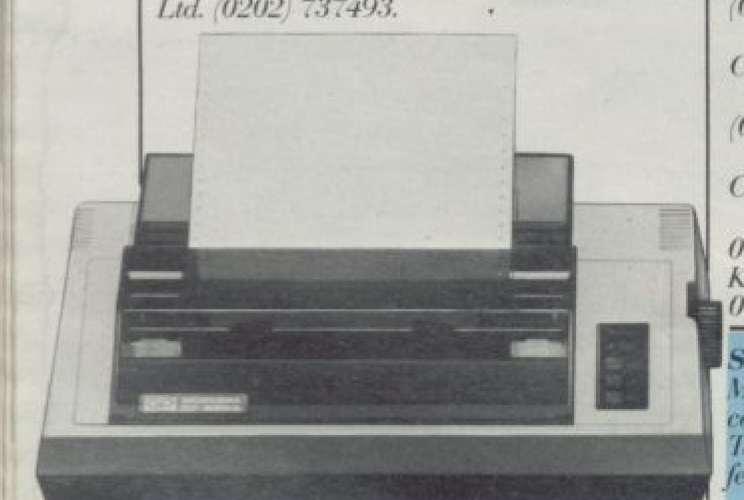
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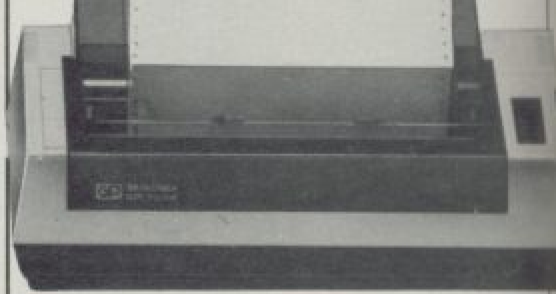
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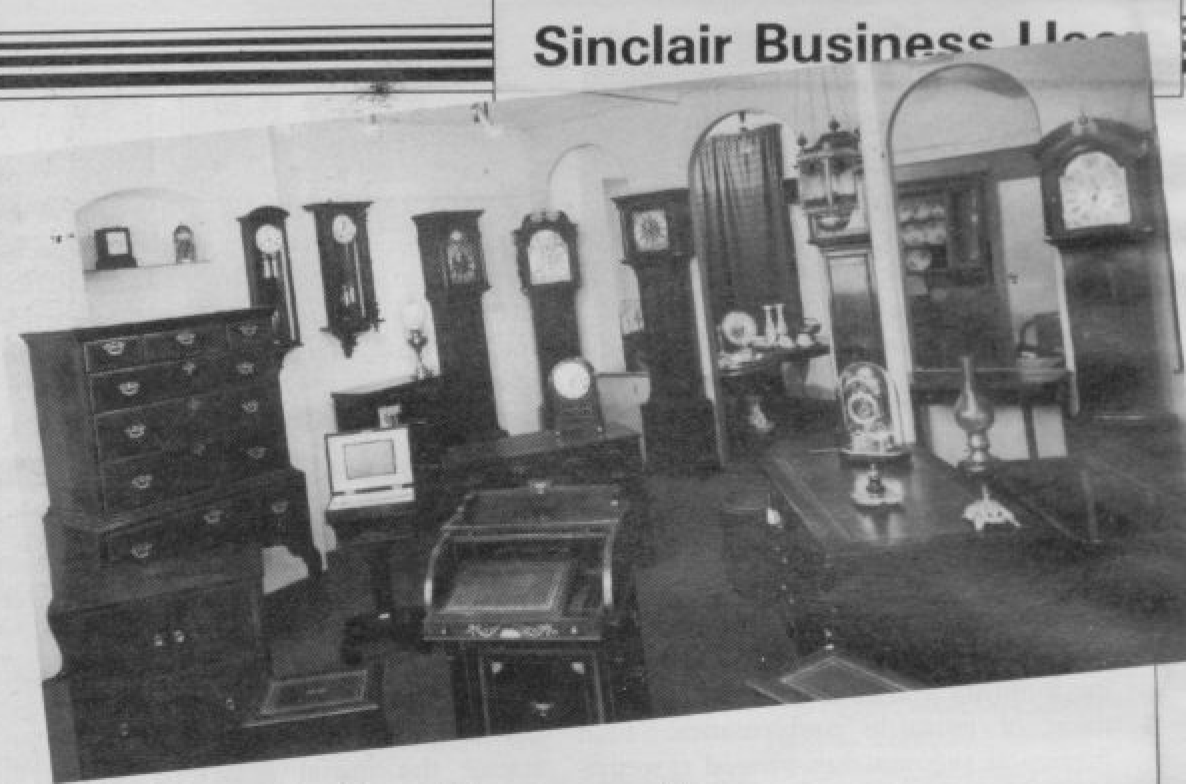
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ZX-81 in the antique shop

Alan Proctor outlines the problems

MY WIFE, SON AND I are employed in the buying, restoration and selling of antique furniture and clocks. As I am a retired civil engineer and my wife takes care of the sharp end of the business I am left to attend to such mundane things as shipping, administration and accounts.

Our business has a turnover which has peaked to around £250,000 per year but is usually around £200,000. We are a limited liability company so the requirements for the maintenance of accounting records and the production of final accounts at the end of a financial year are more stringent than for an unincorporated business such as a partnership or sole proprietor.

Antique dealers, in common with some other traders such as second hand car dealers, may be involved in Special Scheme VAT. The VAT due to the Customs and Excise is calculated on the margin between cost and selling price, not on selling price alone as is the case with the standard VAT scheme, operated by most other business concerns. That introduces a complication for financial accounts whereby purchase cost of individual stock items has to be held until a sale is made.

The cost of employing a bookkeeper – additional to audit fees which we cannot avoid — and a natural aversion to the grind of traditional double entry bookkeeping gave me the final excuse to persuade my wife we should invest in a computer. She agreed to a ZX-81!

That was two years ago. The system now comprises a Memotech 64K memory and parallel interface, a Dean Electronics keyboard, a Seikosha GP100A printer and a rapid load/save Eprom based on Q Save but faster. Without that ROM-based utility, which allows loading or saving the full 64K of memory in 1½ minutes, I do not think the ZX-81 can be seriously considered for general commercial application.

In describing the specification for my system I have to admit that it is a result of evolution during development rather than a system analysis followed by program production. With hindsight I have to admit that I rushed into program coding too early, due the urge to play with the computer. I should have spent more time on detailed system specification in the first instance.

Another lesson learned the hard way was the importance of flowcharting. That technique proved essential both in an overview of the general objectives and subsequently the detailed logic sequences prior to coding. Undoubtedly had I been a trained systems analyst/programmer I would not have made those mistakes — but then neither would I be an antique dealer.

The system now consists of four program segments and two datafiles. All financial transactions are input into ACCTDATA data file by means of ACCTPROG. The principal data array records hold data in a number of categories which describe stock purchases or sales, administrative cost, capital accounts and cash receipts. The system accommodates both direct and credit transaction.

Each record contains the keys necessary to post to all relevant accounts from each transaction. For instance, the single record for purchase of goods on an individual purchase invoice with post, or printout, to purchase ledger, one entry; personal account of supplier, two entries if cash paid; and Bank, for cash account if payment is made at time of purchase. A provision for 1700 financial records has proved more than sufficient for the last financial year. Facilities are also included to deal with opening accounts, standing orders, monthly or annual, and if monthly, full or partial year payments. ACCTDATA contains all the information needed to produce, when needed, details of individual ledger accounts with full or partial listings, or just monthly balances, individual or administrative. Also End of Year final accounts, trial balance and balance sheet.

Whilst the financial accounts do not require details of purchase and sale of individual stock items per se, those details are required to be kept in a specific form by Customs and Excise if the Special VAT scheme is being operated. Also the auditors require full information on all transactions in order to be able to do an audit trace on any constituent part of the accounts.

The additional details are maintained in SALEDATA. Each record in SALEDATA is based on an individual stock reference number. It contains a description of the item, date, details of purchase and sale, client and supplier, sales invoice number, VAT details and cost and sales prices. SALEDATA contains 750 records which have proved more than enough for one financial year.

When data has been input the file on line is ACCTDATA. Those aspects of data required for SALEDATA are transferred on input to low memory (12K — 16K) so that when the new generation of ACCTDATA is saved and the previous generation of SALEDATA is loaded, the data required is not lost.

On loading SALEDATA an instruction is given to STOP the recorder when the old generation is loaded. The data is then transferred into the SALEDATA records from low memory automatically. A further instruction is given

continued on page 164

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to restart the recorder on SAVE and the new generation of SALEDATA is created. That facility of using low memory is extremely useful for data transfer or program operating variables loading when the continued memory required of program and data files are close to 64K.

The SALEPROG segment of the system provides a means of interrogating SALEDATA for given current stock lists, current stock value, details of individual stock items, analysis by invoice number, customer, dealer or item, such as clocks, tables and so on, and reports on monthly transactions with a statement of monthly performance. That particular segment has proved extremely useful to me as a management tool.

The ACCTPRNTPROG segment provides the financial reports from the ACCTDATA records. Those include cash flow and bank balance reports and can also provide analysis of types of expenditure per ledger account. How often has the reader been requested by the tax inspector to provide an analysis of sundry expenses? That single byte in the record provides the facility to produce a full subsidiary analysis, often used by bookkeepers as the preliminary to impersonal account posting.

An interesting feature of ACCTPRNPROG is that it employs an array to control the action to be taken in debiting and crediting accounts, attributing VAT to input or output, depending on the nature of the record. Due to insufficient memory, the array has to be saved in conjunction with ACCTPRNPROG after all other variables have been cleared, using the low memory transfer technique.

A further segment has been developed called INVCPROG. That produces a full invoice with file, invoice number, customer details and full item description. If for export, a shipping invoice is also produced. In that instance the initial data file loaded is SALEDATA. The autoload from low memory subsequently being to ACCTDATA. Although almost complete, my wife and son consider a computer produced invoice is hardly in keeping with the image of an antique shop.

Developments in the world of computers are so fast that whilst my decision two years ago to go ahead with my own system was valid then, I am not sure whether it is so today. Whilst there are a number of financial packages available I do not know of any that cater for Special Scheme VAT. I now have a working package of interactive programs using common data files which is based on output information I want, and an input format to suit me and my business.

I once, somewhat rudely, described the so-called computer specialist as a person who designs a very clever, computer-orientated solution and then seeks out someone whose problem could be made to fit it.

There are many problems for anyone introducing a computer into a small business. If I had made the decisions in our business, we might have had about 50 per cent of the programs completed, but probably no business life to apply them to.

I feel that for most amateurs, serious programming requires an application that borders on obsession. This can produce several strains into the domestic scene. On the other hand, the employment of a professional agent in producing custom-made software would probably result in a cost for software and hardware that the owner of a small business might find hard to justify.

For further information about accountancy programs contact Alan Proctor, Windsor Antiques & Design, 80 High Street, Eton, Windsor, Berks SL4 6AF.

ALL-IN-ONE



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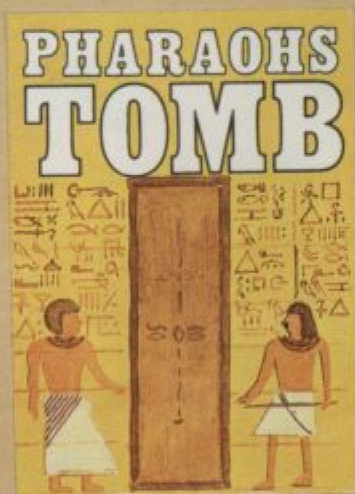
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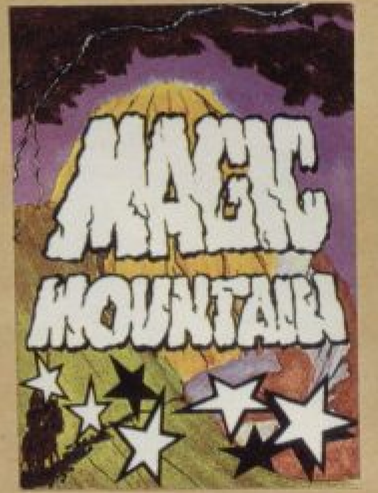
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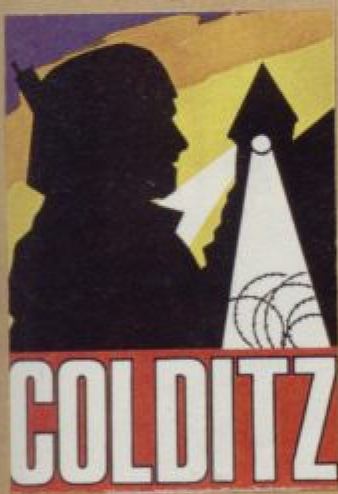
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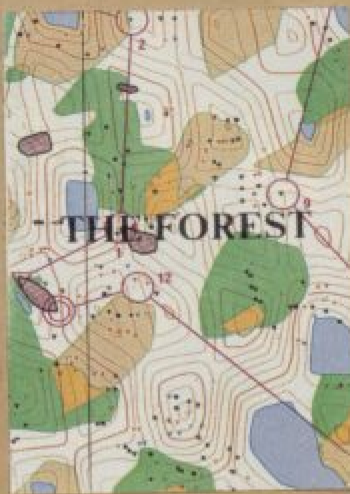
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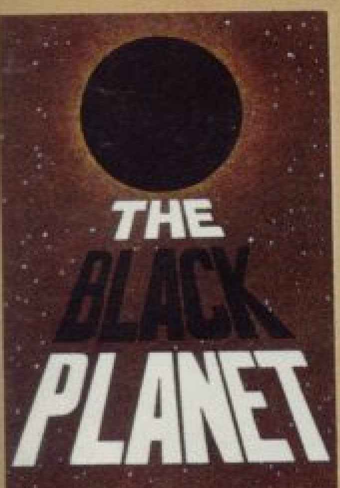
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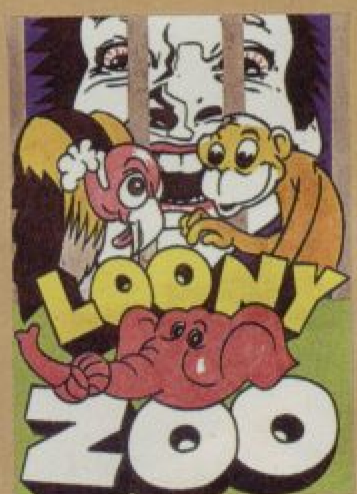
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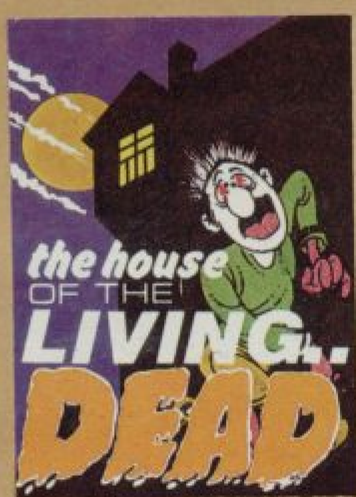
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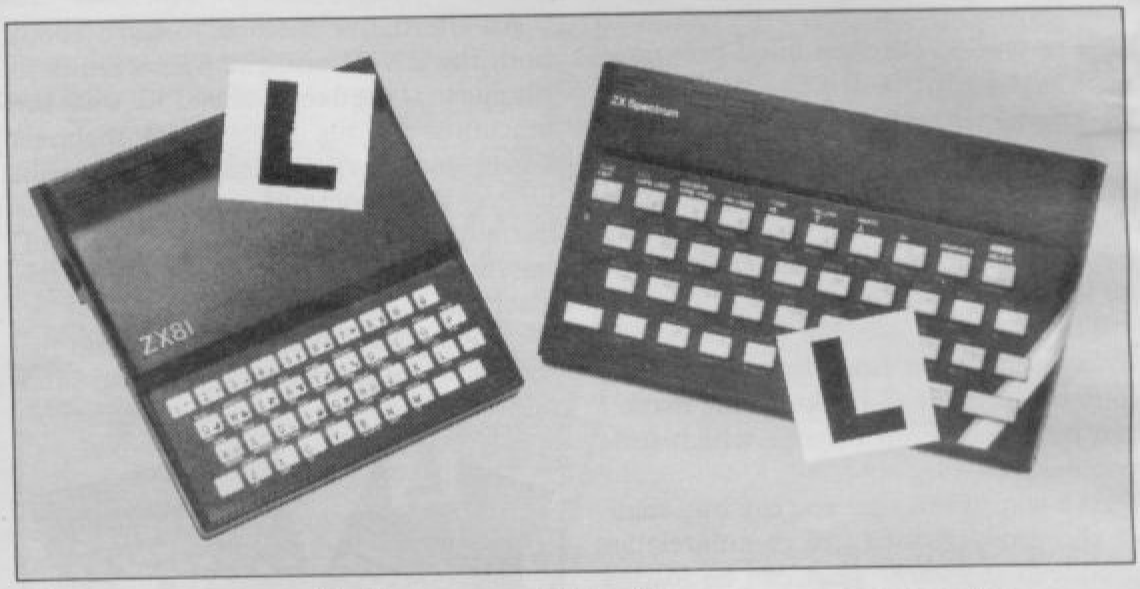
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the QL computer is big enough for use in small businesses, the Sinclair computers are not really suitable for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 170

continued from page 169

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs,* without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

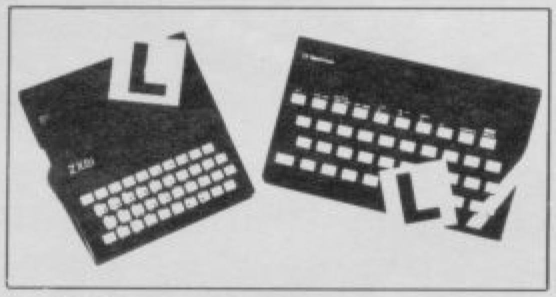
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

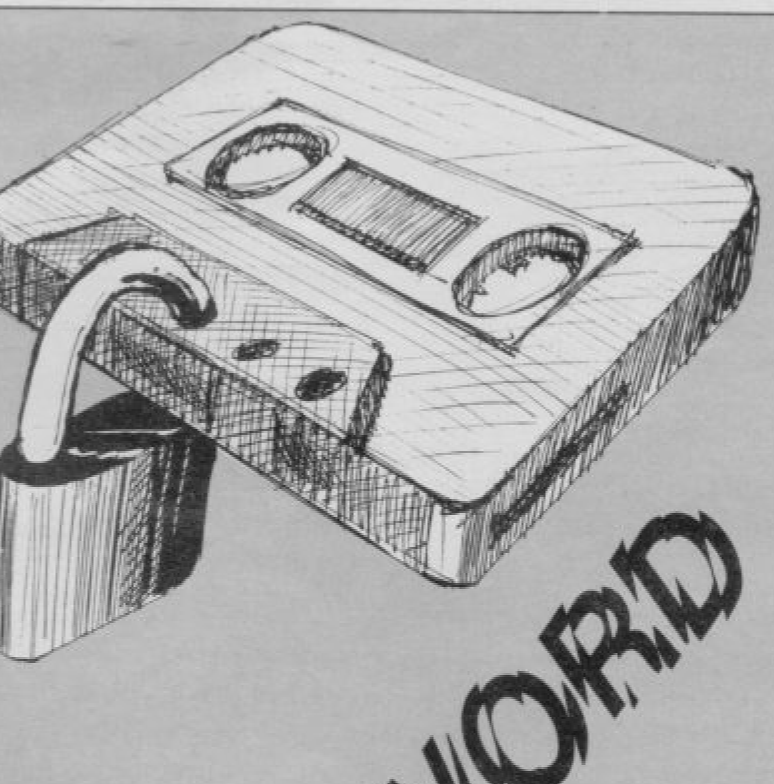
Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



PROTECT your programs from snooping eyes with this simple Basic routine by Hamish Barr of South Wirral. The program asks for a password, in this case 'eugene'. To use your own password simply alter the word 'eugene' in line 60, making sure you use six characters.

The program works by POKEing the number of lines at the bottom of the screen with the value 0. Since that is where error codes are printed, any attempt to BREAK the program will result in a systems crash until the correct password is entered, and the value is reset to 1.

The program can be used with any Spectrum, but please do not use it with programs that you want to send to us for publication!

```
   5 POKE 23659,0
  10 LET s$=""
  20 PRINT AT 12,9;"ENTER PASSWO
RD"
  30 PAUSE 0
  40 LET a$=INKEY$: IF a$="" THE
N  GO TO 40
  45 LET s$=s$+a$
  50 IF LEN s$<>6 THEN  GO TO 30
  60 IF s$<>"eugene" THEN  PRINT
 AT 1,5;"SORRY WRONG PASSWORD":
PAUSE 100: NEW
  70 PRINT AT 16,14;"O.K.": PAUS
E 100
  80 POKE 23659,1
  90 CLS
 100 REM REST OF YOUR PROGRAM
```

DRIVER

DRIVER by D Gough of Ashton-under-Lyme in Manchester is probably the simplest playable game possible on the unexpanded ZX-81. You must use cursor keys 5 and 8 to control the car, avoiding the obstacles in your way.

Variable used:

- A: Holds the horizontal position of the car.
- S: Keeps the score.

Line 10 Sets the horizontal position of the car to 11, which is about a third of the way across the screen.

Line 20 Sets the score to zero.

Line 30 Prints one obstacle at line 21, the bottom of the screen, and at a random position along that line. The obstacle is represented by three asterisks.

Line 40 Sets the print position at the same place as the position of the car. Before the car is printed to the screen, we must check to see that there is nothing already there. That will not happen the first time, but may happen later in the game.

Line 50 This line is one of the most useful programming devices for the ZX-81. It looks directly at the bytes 16398 and 16399 in the systems variable area of the memory, which you would not usually use. Those stores contain the address of the square on the screen where the computer is to print the next character. It then looks at that byte to see whether there is already something there, in this case code number 23, which is the code number of the asterisk. You can find the code numbers for characters in Appendix A of your ZX-81 manual. So taken together, lines 50 and 60 set the print position to where the car should be printed next, and then check to see if there is an asterisk already on the screen in that position.

If there is an asterisk there, then you have crashed, and the program jumps to line 120.

Line 60 Prints the car at the pre-arranged print position, which we now know to be clear of obstacles.

Line 70 Moves the whole display up one line, bringing the new obstacles closer to the car, and leaving room at the bottom for a new one. Any obstacles going off the top of the screen will be lost.

Lines 80-90 Check the keyboard to see which keys you are pressing. If you are pressing five or eight then the position of the car must change, and A is adjusted accordingly.

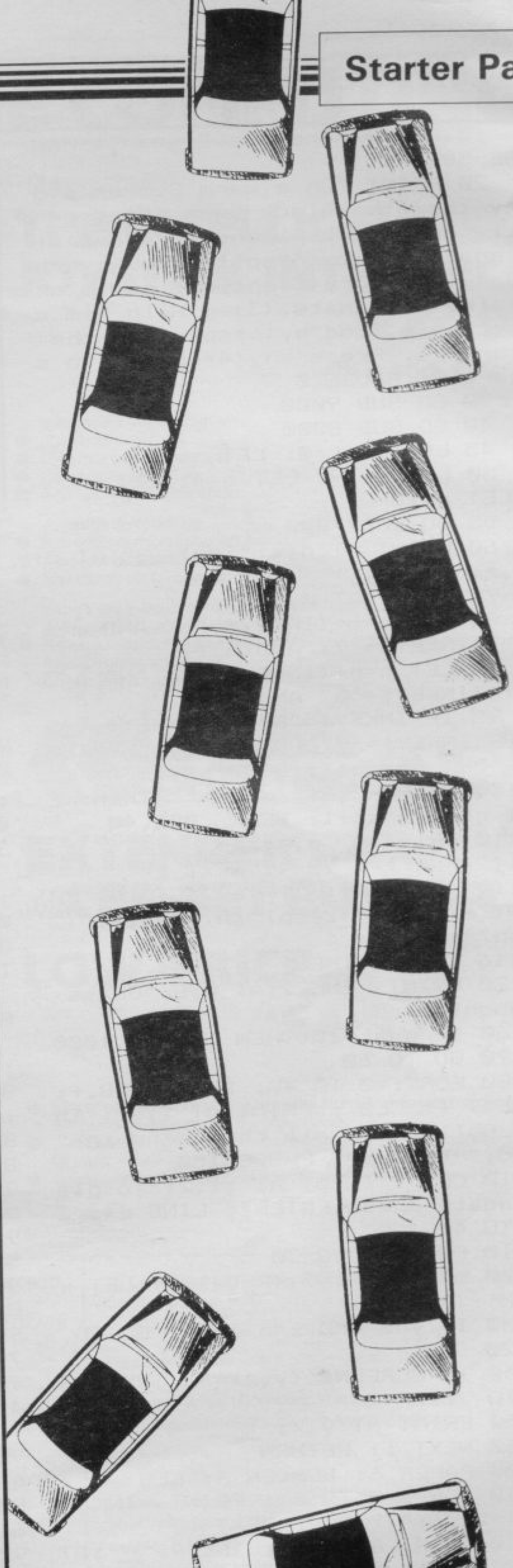
Line 100 Adds ten to your score.

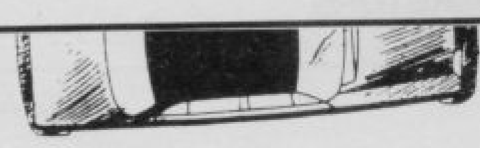
Line 110 Sends you back to the beginning of the main part of the program.

Line 120 You have crashed so the computer prints out your score and then stops.

You could easily adapt the program, still in 1K, to make the game get harder as you play. One possible method would be to have a new variable, say A$, containing the obstacle, and change that each time the score reached a particular level.

```
  1 REM "DRIVER"
 10 LET A=11
 20 LET S=0
 30 PRINT AT 21,INT (RND*26);"*
**"
 40 PRINT AT 0,A;
 50 IF PEEK (PEEK 16398+256*PEE
K 16399)=23 THEN GOTO 120
 60 PRINT "█"
 70 SCROLL
 80 IF INKEY$="5" THEN LET A=A-
1
 90 IF INKEY$="8" THEN LET A=A+
1
100 LET S=S+10
110 GOTO 30
120 PRINT AT 0,0;S
```







BLACK SWAN

EXTREMELY effective use of the user defined graphics on the 16K Spectrum make this game by Michelle Presslie, of Dudley in the West Midlands, a pleasure to watch. You are a swallow who must eat as many gnats as possible in as short a time as you can, while below a black swan swims elegantly among the bulrushes.

The program uses our special abbreviations for graphics characters. Please read the instructions on the first page of Program Printout before typing in the program.

```
  10 PRINT "The Black swan": PAU
SE 50
  20 PRINT "On a warm Summer's d
ay the(6*sp)Black Swan swims gen
tly on his(2*sp)pond. A cloud of
 gnats hovers(3*sp)lazily  overh
ead. A hungry(6*sp)swallow is ch
asing the gnats.(3*sp)Help him c
atch his food by(6*sp)using the
cursors. Press any(4*sp)key to s
tart.": PAUSE 0
  30 GO SUB 9000
  40 GO SUB 8000
  45 LET gnat=0: LET go=0
  50 LET d=19: LET a=4: LET m=3:
 LET n=28
  55 GO SUB 7000
  60 PRINT AT d,a;"(sp)AB";AT d+
1,a;"(sp)CD"
  75 PRINT AT m,n;"(sp)"
  80 LET m=m+(INKEY$="6" AND m<1
4)-(INKEY$="7" AND m>1)
  90 LET n=n+(INKEY$="8" AND n<3
1)-(INKEY$="5" AND n>0)
  95 IF INKEY$="5" OR INKEY$="6"
 OR INKEY$="7" OR INKEY$="8" THE
N  LET go=go+1: BEEP .005,30
 100 IF SCREEN$ (m,n)="" THEN  L
ET gnat=gnat+1: BEEP .008,40
 110 PRINT AT m,n;"H"
 112 FOR i=1 TO 4: NEXT i
 114 LET a=a+1: IF a>23 THEN  PR
INT AT d,a;"(2*sp)";AT d+1,a;"(2
*sp)": LET a=4
 116 IF a<4 THEN  LET a=4
 120 PRINT  INK 2;AT 0,8;"Gnats
caught(2*sp)"; gnat
 160 IF gnat=30 THEN  GO TO 1000
 170 GO TO 60
1000 FOR f=0 TO 40: BEEP .008,f:
 NEXT f: CLS : PRINT AT 11,0;"Th
e swallow ate all the gnats in "
;go;" swoops": PAUSE 150
1010 CLS : INPUT AT 11,2;"To pla
y again press ENTER"; LINE c$: G
O TO 40
7010 FOR i=1 TO 30
7020 LET y=2+INT (RND*12): LET x
=INT (RND*31)
7030 IF y=m AND x=n THEN  GO TO
7020
7040 IF SCREEN$ (y,x)="" THEN  G
O TO 7020
7050 PRINT AT y,x;"E"
7060 NEXT i: RETURN
8000 PAPER 6: BORDER 4: CLS
8010 FOR f=0 TO 31: PRINT  INK 5
;AT 21,f;"(ig8)": NEXT f
8110 PRINT AT 19,1; INK 4;"F";AT
 19,3; INK 4;"F";AT 19,26; INK 4
;"F";AT 19,28; INK 4;"F";AT 19,3
0; INK 4;"F"
8120 PRINT AT 20,1; INK 4;"F";AT
 20,3; INK 4;"F";AT 20,26; INK 4
;"F";AT 20,28; INK 4;"F";AT 20,3
0; INK 4;"F"
8130 PRINT AT 18,1;"G";AT 18,3;
INK 4;"F";AT 18,26;"F";AT 18,28;
 INK 4;"F";AT 18,30; INK 4;"F"
8140 PRINT AT 17,3;"G";AT 17,26;
"G";AT 17,28; INK 4;"F";AT 17,30
; INK 4;"F"
8150 PRINT AT 16,28;"G";AT 16,30
; INK 4;"F"
8160 PRINT AT 15,30;"G"
8200 RETURN
9000 FOR n=USR "a" TO USR "h"+7
9010 READ v: POKE n,v: NEXT n
9020 DATA 0,0,224,112,60,62,31,1
5
9030 DATA 0,48,120,104,124,102,4
8,56
9040 DATA 7,231,55,31,143,255,12
7,63
9050 DATA 204,238,255,255,255,25
4,252,248
9060 DATA 0,0,20,8,0,0,0,0
9065 DATA 16,16,16,16,16,16,16,1
6
9070 DATA 16,56,56,56,56,56,56,1
6
9080 DATA 1,5,106,220,60,2,1,0
9090 RETURN
```

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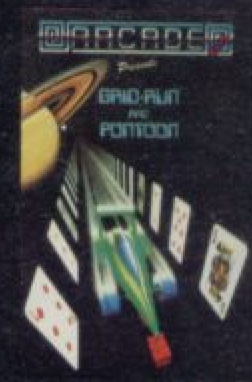
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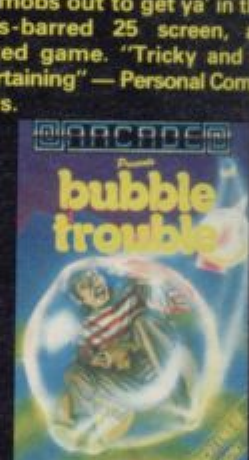
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An object lesson for adventurers

Quentin Heath describes a simple system for creating complex adventures

ARTIFICIALLY intelligent characters can add atmosphere to any adventure game, but the most important parts remain the scenario and the objects it contains.

The most popular means of programming a scenario is to use a grid, first plotted on paper and then transferred to the computer either as a compact data block within a machine code program or an array within a Basic program. Such a

	1	2	3
A			
B	1000 1030 1060	2000 0 0	
C			

Figure 1. Argolian grid.

structure is shown in figure one which is the floor plan of an Argolian monastery. each of the squares represents one move and the scale could be adjusted to make it one room or part of a room.

The floorplan in figure one does not contain any information about the locations. Instead it contains a list of numbers. These values are address pointers to various other lists which describe locations and events within them. In figure one, for instance, location B1 lists a series of numbers which in themselves mean nothing. To the adventure control program, however, each number has a meaning and they are:

room description = 1000
monster description = 1030
object description = 1060

When the program's movement routine places a player at room B1 in the monastery it needs a long location description in order to inform the player what is going on. It finds the number 1000 in that position on the list and then goes to the memory address where the room description is stored. When it has found it the program gives the information in figure two to the player.

The next action of the program, is to see if any objects are stored within the room. The object description for room B1 is placed at memory location 1060 and printed out after a location description. In the example the object is a small glass egg and the program would produce the printout shown in figure three.

If no object has been stored in a particular location the address indicator in the grid for 'object description' should contain a value which tells the program not to look for an object. The program may also change the value if an object is removed during play.

Using the grid system the task of programming a game is made easier because the program only needs to manipulate the grid of memory references and not the lists of descriptions.

The grid in the example is simple and more factors can, and should, be added to it. For instance, the fighting abilities of a monster who is known to haunt a room could be included in a list indicated by the location grid.

address	room	monster	object
1000	dark room		
1030		Smike	
1060			crystal egg
2000	chapel		
0			
0			

Figure 2.

These numbers, discussed last month in *Mind Games,* could be compared to player strengths and weaknesses when a fight takes place and changed as the monster wins or loses. If death occurs a zero can be placed in the reference grid.

The monastery shown in the example grid has only one level. It is, however, easy to develop a grid in which you can move to different floors.

Grids should be created as if they were being produced for a one level adventure but with one important difference. A new reference is added to the list for each location which indicates whether there is a staircase in the room and in which direction, up or down, it goes. The grids are laid end to end in memory.

All the computer needs to do is look at the indicators on the list. If they are set to any number except zero there is a staircase in the room. The player is then asked whether a transition from one floor to another is required. If so, the program then switches to a different floor.

The example, which uses absolute RAM memory addresses, is for a machine code adventure program but by creating a series of arrays, one for each grid and one for each list of information, the grid reference system can be used within a Basic adventure program. The machine code addresses are translated into array elements and a three dimensional array can store any number of grids.

The grid reference system is simple to use and, with the techniques described in previous articles about character generation and manipulation, should enable a substantial artificially intelligent adventure game to be written.

Your are standing in a **DARK** room.
There is a **CRYSTAL EGG** in the room which is guarded by a **SMIKE.**

Figure 3.



Amazing how played out some things



gsecome.





be made to the program in table 2 to scroll the screen upwards but I have not shown them because it is easier to use the SCROLL command.

The first program works as follows. Variables A and B are set to the values of D-FILE and VARS less one, that is to the addresses of the beginning and end of the display file respectively. Then each location in the display file is inspected in turn using variable I. If it does not contain 118 then the value in it is POKEd into the location to the left or

Moving displays in black and white



Andrew Hewson looks at the position of the ZX-81 screen display and shows how to produce headerless files on the Spectrum

I HAVE NOTICED a decrease in the number of questions from ZX-81 owners in the past year and so I have tended to concentrate on the Spectrum. This month I redress the balance.

The first question, from Mr Dave Harris of Abingdon, introduces the theme: **Can you explain the ZX-81 display file?"**

The area at the bottom of RAM between 16384 and 16508 holds the system variables and is followed by the program area, starting at 16509. The display file is next but as programs can vary in length, the display file does not start at a fixed address. The ZX-81 keeps track of it by storing the current value of the starting address in D-FILE.

If you look at page 178 of the manual you will see that the value of D-FILE is stored at address 16396 and so you might infer that you have only to look at the contents of 16396 to find the value of D-FILE.

Unfortunately, that is not true. Remember that the value of D-FILE is an address and that addresses are whole numbers, like 16384 and 17407 and 32767. A single location can only hold a number between 0 and 255 and so two adjacent locations are used to store large numbers. The value of D-FILE is given by: value in 16396 + 256*value in 16397. Any whole number between 0 and 65535 inclusive can be stored using that system. The value held at an address can be found by PEEKing at it and so you can PRINT the value of D-FILE by entering:

```
PRINT PEEK 16396 + 256*PEEK
16397
```

You may know that the contents of the first location in the display file is always 118 and you can show that by entering:

```
PRINT PEEK (PEEK 16396 +
256*PEEK 16397)
```

Similarly, the address of the end of the display is held in VARS — or more correctly is one less than the value in VARS — and can be PRINTed by entering:

```
PRINT PEEK 16400 + 256*PEEK
16401-1
```

Each line displayed on the screen is teminated by a byte containing decimal 118 and there is one more byte at the beginning of the file also containing 118. As there are 24 lines in the display, there are 25 bytes containing 118 and it is essential to the correct functioning of the display software that all 25 bytes are present.

With an unexpanded ZX-81 the display file consists of those 25 bytes and no more unless a LIST, PRINT or PLOT command has been executed since the last CLS or RUN command. That is a device to keep the display file as small as possible.

With a memory expansion pack of 4K or more the ZX-81 pads-out the display file with 32 bytes per line each containing zero — i.e., blanks.

Mark Wilson of Aberdeen writes: **"Could you please tell me how to scroll the ZX-81 screen up, down, left and right?"**

To scroll the screen downwards or from side to side it is necessary to rearrange the contents of the display file in the appropriate logical fashion. There is one rule which must be obeyed whilst such rearrangements are in progress. It is that whilst running in SLOW mode the ZX-81 display file must contain at least 25 bytes holding 118 at all times. If that rule is broken the consequences are dire — the machine crashes and the only remedy is to pull out the plug and start again.

Tables 1 and 2 consist of programs to scroll the display from side to side and downwards respectively. A few simple alterations as shown to the program in table 1 will change the direction of scrolling from right to left to left to right as required. Similar changes could be made to the program in table 2 to scroll the screen upwards but I have not shown them because it is easier to use the SCROLL command.

The first program works as follows. Variables A and B are set to the values of D-FILE and VARS less one, that is to the addresses of the beginning and end of the display file respectively. Then each location in the display file is inspected in turn using variable I. If it does not contain 118 then the value in it is POKEd into the location to the left or

continued on page 182

```
100  LET A=PEEK 16396+256*
     PEEK 16397
110  LET B=PEEK 16400+256*
     PEEK 16401-1
120  LET D=1
130  LET I=B
150  LET S=PEEK I
160  LET I=I-D
170  IF PEEK I=118 THEN GOTO
     200
180  POKE I+D,PEEK I
190  GOTO 160
200  POKE I+D,S
210  IF I=A THEN STOP
220  LET I=I-D
230  GOTO150
```

Table 1. A program to scroll the ZX-81 display from left to right. To scroll from right to left alter lines 120, 130 and 210 as follows:

```
120  LET D=-1
130  LET I=A
210  IF I=B THEN  STOP
```

continued from page 181

to the right — depending on the value set for D in line 120 — and the routine loops to line 160 to inspect the next location.

If a location contains 118 the value from the beginning of the line — stored in variable — is POKEd into the adjacent location. That is the way in which a wraparound effect is achieved. A test is then made — line 210 — to see if the job is completed. The second program works in an analogous fashion.

Adrian Neilson of Dedridge, West Lothian writes: **"Please explain how to get a scan going across the screen which makes up a picture and the name of the game and then fills in with colour".**

The technique is very straight forward and is explained in the Spectrum Manual but I have received several letters on the topic. The current Spectrum display can be SAVEd at any time using either of the commands:

SAVE "name" SCREEN$

or

SAVE "name" CODE 16384,6912

The display can be LOADed by entering any of the following:

LOAD "name" SCREEN$
LOAD "name" CODE 16384,6912
LOAD "name" CODE

A particular problem with SAVEing and LOADing the screen is that the various commands and messages are also displayed on the screen. In doing so they prevent the programmer from having full flexibility in the way in which he constructs his display.

A way around the problem is to reserve space RAMTOP for a copy of the display by entering

CLEAR 58623

and to use the area to maintain a copy of the required display. A display which is SAVEd from the upper area will automatically LOAD into the display file if the SCREEN$ qualifier is used, i.e. the following pair of instructions are mutually compatible:

SAVE "name" CODE 58623,6912
LOAD "name" SCREEN$

Lindsey Round of Chessington, Surrey has written to say: **"How do you create headerless files and save and load them on the Spectrum?"**

In normal operation all Spectrum cassette files are SAVEd and LOADed in two parts. The first part is very short and specifies the name, type, length, and so on of the main part of the file. On reading the header the Spectrum checks that the name and type match that which it is looking for and displays them on the screen. The remaining data are used by the main loading routine so that it knows where to place the incoming data and how much there will be of it.

The main saving and loading routines in ROM can be called directly from a machine code routine provided the correct parameters are passed in the appropriate Z80 registers. In that way headerless files may be written and read to and from cassette.

Table 3 lists the various parameters and their interpretations and table 4 lists two routines which SAVE and LOAD the screen in that fashion. The routines can be loaded into the Spectrum using an assembler or using the simple decimal loader listed in table 5.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

```
100  LET A=PEEK 16396+256*PEEK 16397
110  LET B=PEEK 16400+256*PEEK 16401-1
120  LET C=I
130  IF PEEK (B-C)=118 THEN GOTO 160
140  LET C=C+1
150  GOTO 130
160  FAST
170  FOR I=B-1 TO A+C STEP -1
180  POKE I,PEEK (I-C)
190  NEXT I
200  FOR I=A+1 TO A+C-1
210  POKE I,0
220  NEXT I
```

Table 2. A program to scroll the ZX-81 display downwards.

	To Save	To Load
Carry flag status	Clear	Set
A register contents	255 (ffh)	255 (ffh)
IX register contents	Address to SAVE from	Address to LOAD to
DE register contents	Number of bytes to SAVE	Number of bytes to LOAD
Address of ROM routine	1218 (04c2h)	1366 (0556h)

Table 3. Parameters of Spectrum routines to SAVE and LOAD headerless files.

Decimal	Assembler	Comment
167	AND A	Clear carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	SAVE from 16384
17 48 24	LD DE,6192	Length 6192
205 194 4	CALL 1218	Call SAVE routine
201	RET	Return
55	SCF	Set carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	LOAD 16384
17 48 24	LD DE,6192	Length 6192
205 86 5	CALL 1366	Call LOAD routine
201	RET	Return

Table 4. Two Spectrum routines to SAVE and LOAD the screen display to and from a headerless file.

```
10   LET I=23296
20   INPUT J
30   POKE I,J
40   PRINT I, PEEK I
50   GOTO 20
```

Table 5. A simple Spectrum program for loading decimal code into the printer buffer. When used to store the routine in Table 4 the routines can be called at addresses 23296 and 23310.

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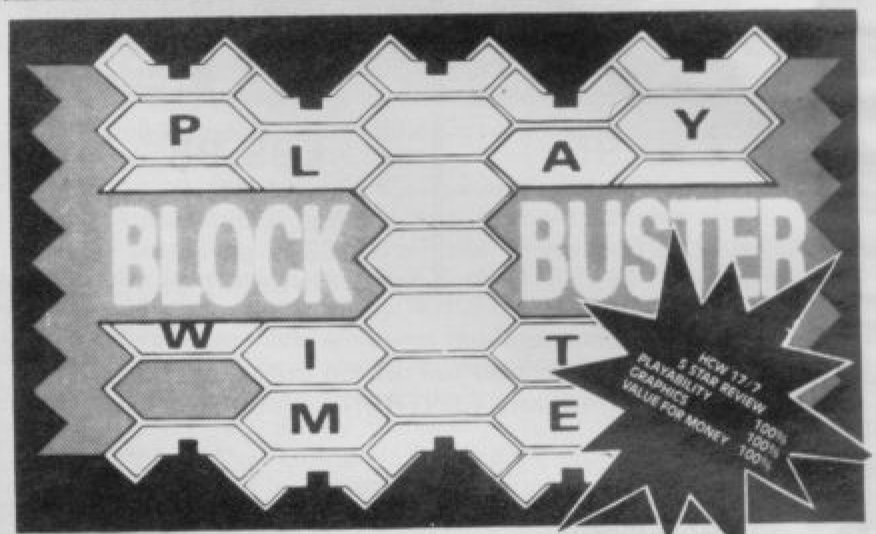
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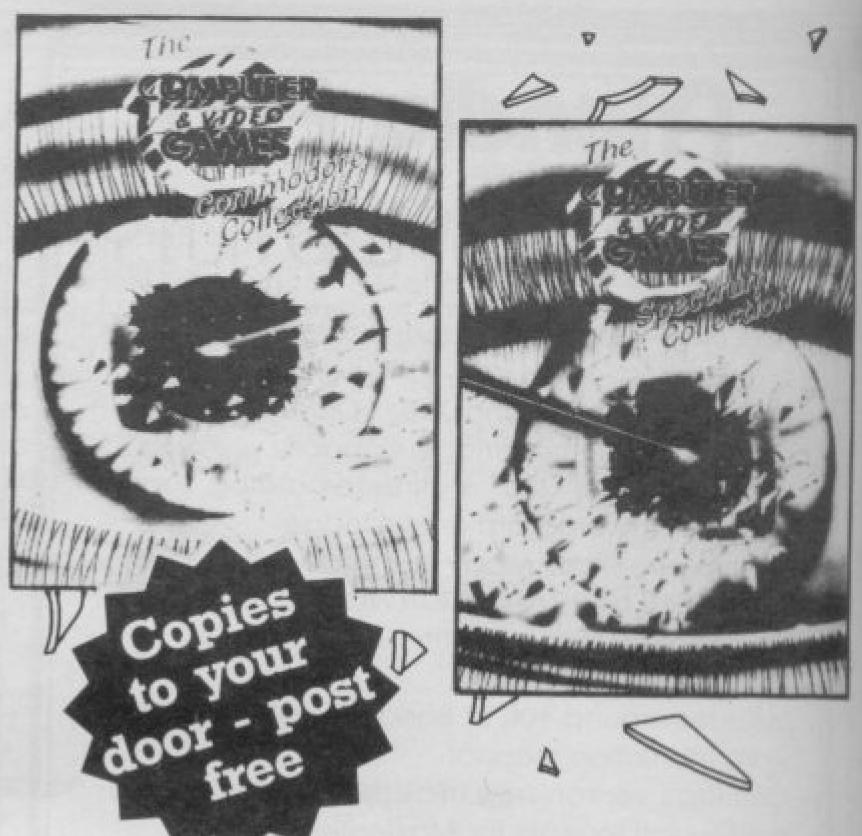
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Finland: ZX-kerho, c/o Kalevi Hamalainen, Siltakatu 9 A 8, 33100 Tampere 10, Finland. Phone 35831-34238. Publishes quarterly paper.

France: Yves Chapron, no. SUS-1047, Rue du Puy, La Terrasse, 38660 Le Touvet, France. Specifically for users in the Alps.

Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

Greece: Athens Spectrum Club, Paris Stamelos, Spetsou 2, isi22 Marousi, Athens, Greece.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.

Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

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Club Corner

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Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

The Netherlands: Clive's Bits and Bytes, Nicholas Beets Straat 164, 6416 VX Heerlen. Telephone 045-423024. Both Spectrum and ZX-81 users welcome.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.
Dumont and Syndercombe Amateur Computer Club. Jean-Pierre Dumont would like to correspond with ZX-81 owners via tapes. Write to 8 Kipling Road, Farrarmere, Benoni 1500, Transvaal.

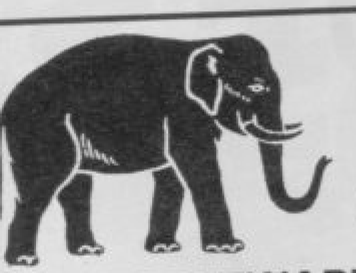
ZX SA Club: Jonathan Jones, House 14, Anglo Alpha PO Box 15, 1725 Roodepoorf.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).—SAF Users' Group, 2749 Eden Road, Leslie, Michigan 49251.—ZX Users Group of New York, Box 560 Wall Street, New York, N.Y. USA 10005. Subscription $15US, publishes international newsletter. Seeks newsletter exchange with other groups.

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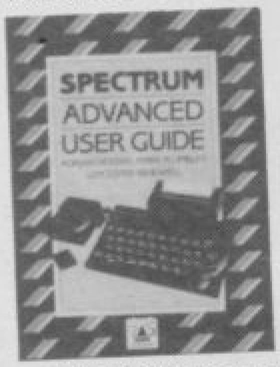
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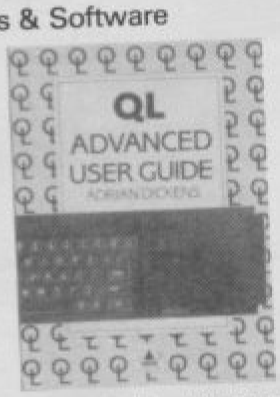
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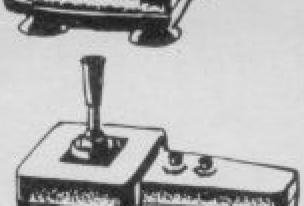
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ZX-81

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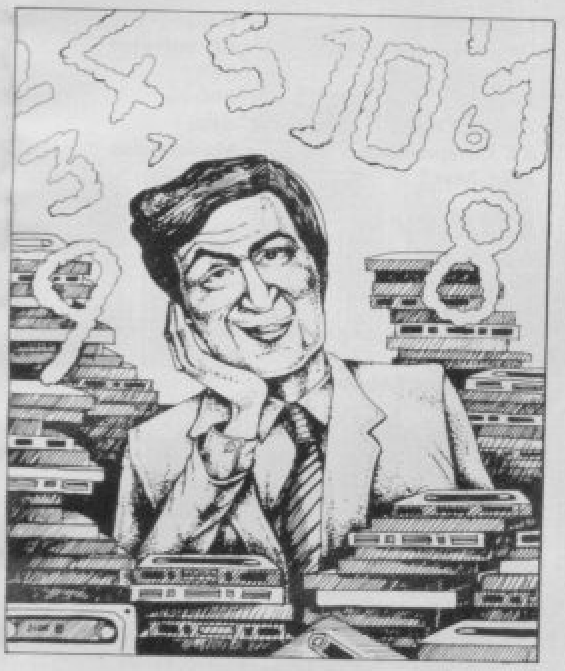
Android One	Vortex	*
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Time Bandits	New Soft	*

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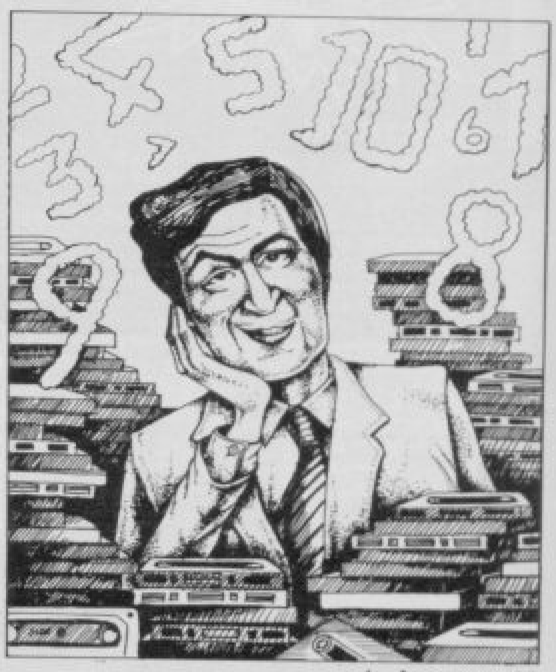
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Demon Lord	MCE	5
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Everest Ascent	Sheperd	6
Fantasia Diamond	Hewson	7
Golden Apple	Artic	7
Gorgon	Phipps	*
Halls of Things	Crystal Comp.	9
Here comes the sun	Alligata	7
Hobbit	Melbourne House	9
Hole	Add-on	*
Horror Atoll	Add-on	*
Inca Curse	Artic	6
Inferno	Shepherd	7
Invincible Island	Shepherd	8
Island	Crystal	4
Island	Virgin	7
Jericho Road	Shards	7
Jungle Adventure	CCS	4
Knight's Quest	Phipps	6
Leopard Lord	Add-on	4
Lords of Midnight	Beyond	9
Lords of Time	Level Nine	8
Lost Over Bermuda	Add-on	*
Mad Martha	Mikro-Gen	7
Mad Martha II	Mikro-Gen	*
Mountains of Ket	Incentive	8
Murder at Manor	Gemtime	7
Mysterious Fairground	Buffer Micro	6
Odyssey of Hope	Martech	6
Oracle's Cave	Doric	8
Orb	Comp. Rentals	*
Paradox	Runesoft	2
Perseus and Andromeda	Channel 8	7
Pimania	Automata	7
Quest	Hewson	7
Quetzalcoatl	Virgin	8
Roundsby Incident	Add-on	*
Satan's Pendulum	Minatron	7
Sherlock	Melbourne House	9
Ship of Doom	Artic	7
Solaris	Softel	*
Spoof	Runesoft	7
Snowball	Level 9	9
Superspy	Shepherd	5
Temple of Vran	Incentive	8
Terror from The Deep	Add-on	*
Time Quest	Mikro-Gen	*
Titanic	R&R	5
Transylvanian Tower	Shepherd	7
Urban Upstart	Shepherd	*
Valhalla	Legend	7
Vampire Village	Terminal	4
Velnor's Lair	Quicksilva	8
Volcanic Dungeon	Mastervision	6
Width of the World	Mosaic	4
Wrath of Magra	Mastervision	8
Ziggarat of Dread	Add-on	*

Arcade

Ad Astra	Gargoyle Games	8
Adven. of a St Bernard	Mastertronic	7
Alcatraz Harry	Mastertronic	3
Android Two	Vortex	*
Ant Attack	Quicksilva	8
Antics	Bug-Byte	8
Arena 3000	Microdeal	5
Armageddon	Silversoft	3
Atic Atac	Ultimate	8
Automania	Micro-Gen	6
Base Invaders	Work Force	6
Bear Bovver	Artic	8
Birds and Bees	Bug-Byte	8
Blade Alley	PSS	6
Blue Thunder	Foundry Systems	6
Brain Damage	Silversoft	*
Bubble Buster	Sinclair	5
Bubble Trouble	Arcade	*
Bugaboo	Quicksilva	7
Butterfly	Pulsonic	4
Caesar the Cat	Mirrorsoft	7
Carnival	Eclipse	5
Carpet Capers	Termial	7
Cavelon	Ocean	7
Centipoid Plus 3	Orwin	5
Chequered Flag	Sinclair	8
Chuckie Egg	A & F	8
Chuckman	CCI/Add-on	8
Close-In	Pulsonic	4
Codename Mat	Micromega	9
Corridors of Genon	New Generation	9
Cruise Attack	Mikro-Gen	*
Cyber Zone	Crystal	*
Death Chess 5000	Artic	7
Defenda	Interstella	2
Deffendar	Mikro-Gen	*
Defusion	Incentive	6
Defusion/Worms	K-Tel	3
Demon	Microcosm	*
Demon Chase	Mansfield	4
Devil Rides In	Mastertronic	7
Dimension Destructors	Artic	8
Dinky Digger	Postern	4
Dodge City	Phoenix	7
Dr Franky and the Monster	Virgin	6
Driller Tanks	Sinclair	3
Elektro Storm	PSS	*
Energy 30,000	Elm	3
Eric and the Floaters	Sinclair	6
Eskimo Eddie	Ocean	4
Frank N Stein	PSS	7
Fred	Quicksilva	6
Freez Beez	Silversoft	*
Froot Loop	NTD Software	5
Galaxy Attack	Sunshine	4
Glug Glug	CRL	6
Harry Goes Home	Pulsonic	6
Hickstead	CCS	4
High Noon	Work Force	9
House of Living Dead	Phipps	*
Hunchback	Ocean	7
Invasion Body Snatch.	Crystal	9
Jack and the Beanstalk	Thor	5
Jackpot	Comp. Rentals	*
Jet Set Willy	Software Projects	9
Killer Knight	Phipps	5
Knight Rider	Hewson	*
Kosmic Kanga	Micromania	5
Krakatoa	Abbex	8
Krazy Kong	PSS	*
Laser Zone	Quicksilva	8
Laserwarp	Mikro-Gen	6
Last Sunset Lattica	Arcade	*
Lazatron	Contrast	*
Les Flics	PSS	6
Loony Zoo	Phipps	6
Lunar Jetman	Ultimate	8
Manic Miner	Bug-Byte	9
Matrix	Salamander	7
Maze Death Race	PSS	*
Maziacs	dk'tronics	8
Metagalactic Llamas	Salamander	8
Mission Impossible	Silversoft	6
Mission Omega	Pulsonic	4
Monkey Biznes	Artic	7
Moon Alert	Ocean	*
Moons of Tantalus	Cornhill	5
Mr Wimpey	Ocean	7
Mummy Mummy	Lothlorien	6
Munnery's Mergatroids	Abacus	6
1994	Visions	4
Olympimania	Automata	6
Orion	Software Projects	5
Paratroopers	Rabbit	4
Pat the Postman	Mikro-Gen	*
Pedro	Beau Jolly	7
Penetrator	Melbourne House	7
Pi-Balled	Automata	7
Pi-Eyed	Automata	6
Pingo	Profisoft	6
Psi-Spy	Postern	5
Pssst	Ultimate	7
Psytron	Beyond	9
Pyramid	Fantasy	8
Raider Cursed Mine	Arcade	*
Rapscallion	Bug-Byte	6
Reactor	Gemini	7
Rescue	Comp. Rentals	*
Rescue	Ocean	*
Revenge of the Killer Tomatoes	Visions	6
Rider	Virgin	6
River Rescue	Creative Sparks	3
Robot Riot	Silversoft	6
Rommels Revenge	Crystal	8
Sabre Wulf	Ultimate	8
Scuba Dive	Durrell	9
Security Shelter	Add-on	*
Skull	Games Machine	5
Sorcery	Virgin	7
Space Station Zebra	Beyond	6
Spectron	Virgin	6
Spellbound	Beyond	7
Splat	Incentive	8
Stop the Express	Sinclair	8
Submarine Strike	Pulsonic	6
Tank Trax	Mastertronic	3
The Guardian	PSS	6
The Pyramid	Fantasy	7
The Snowman	Quicksilva	8
3D Bat Attack	Cheetahsoft	6
3D Lunattack	Hewson	6
3D Seiddab Attack	Hewson	5
3D Star Wars	Add-on	1
3D Tunnel	New Generation	9
Time Gate	Quicksilva	8
Timebomb	CDS	7
Tobor	Add-on	7
Tornado Low Level	Vortex	8
Tranz Am	Ultimate	*
Trashman	New Generation	8
Traxx	Quicksilva	7
Tribble Trubble	Software Projects	8
Trom	dk'tronics	4
Tutankhamun	Micromania	8
Two-Gun Turtle	Lothlorien	7
Warlock of Firetop Mountain	Penguin	*
Wheelie	Microsphere	7
Worm Attack	Pulsonic	2
Worse Things Happen at Sea	Silversoft	7
Xadom	Quicksilva	4
Zig-Zag	dk'tronics	7
Zipper Flipper	Sinclair	4

Business

Account Management System	Fulwood	*
Accounts (Limited Company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Address File	SD Micro	*
Address Manager	OCP	7
Bank Account System	K Gouldstone	8
Bank Verifier	SD Micro	*
Business Bank Account	Transform	*
Cash Controller	Shepherd	7
Collector's Pack	Sinclair	7
Critical Path Analysis	Hilderbay	*
Database	Microl	7
DIY Book-keeping	RAMTOP	*
Heathplanner	Heath Computing	7
Investment, Insurance, Information	Inform	5
Masterfile	Campbell	8



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Multi-File	ISP	6
Omnicalc	Microsphere	9
Payroll	Hilderbay	9
Payroll	Transform	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Personal Financ. Management Syst.	Fulwood	*
Sales Day Book	Transform	*
Small Business Accounts	Sinclair	*
Spectext	McGraw Hill	7
Spreadsheet	Microl	7
Stock Control	Hilderbay	*
Stock Control	Kemp	*
Stock Control	Transform	*
Tasword	Tasman	8
Tasword II	Tasman	9
Utility File	SD Micro	*
Word Processor	Microl	*
Word Processor	Quicksilva	2

Education

ABC Liftoff	Longman	*
Angle	Chalksoft	5
Angle Turner	Arnold Wheaton	7
Astro Maths	Scisoft	6
Blockbuster	Compusound	7
Castle	L'Ensouleiado	7
Castle of Dreams	Widgit	7
Castle Spellerous	Sinclair	8
Chess Tutor 1	Sinclair	7
Cortes	L'Ensouleiado	6
Countabout	Longman	*
Dyslexia Beater	Dunitz	8
Eiffel Tower	Chalksoft	6
Electronic Learner's Guide No. 1	ETST	6
French is Fun	CDS	5
French Mistress	Kosmos	*
French Voc Test	Tutorial	*
German is Fun	CDS	8
German Master	Kosmos	*
Guitar Tutor 1	Harlequin	*
Guitar Tutor 2	Harlequin	*
Handwriting	Chalksoft	*
Hotline	Chalksoft	5
Humpty Dumpty	Widget	8
Inkosi	Chalksoft	5
Jungle Jumble	Clever Cloggs	*
Jungle Maths	Scisoft	*
Learn to Read 1-5	Sinclair	7
Letters and Numbers	Jimjams	*
Linkword	Silversoft	6
Look Sharp	Mirrorsoft	7
Magnets	Sinclair	*
Make-a-Chip	Sinclair	*
Mansfield Park	Sussex	7
Mathskills II	Griffin	7
MDA-PCSS	MDA Assoc.	7
Model Maths	Jive	*
Mr T's Measuring Games	Ebury	7
Mr. Men	Mirror	*
Musicmaster	Sinclair	6
Nineteenth C. England	Sussex	8
O Level Chemistry	Calpac	*
O Level Physics	Think Tank	*
Party Time	C. Tutor	*
Pathfinder	Widget	7
Pirate	Chalksoft	7
Quick Thinking	Mirrorsoft	*
Sequences	Chalksoft	5
Spanish Gold	Chalksoft	*
Speak and Spell	S and G	*
Speech Marks	Sinclair	7
Spelling Bee	Image Systems	5
Star Reader	Scisoft	*
Startrucker	Widget	7
Teacher Data	B Farris	8
Tense French	Sulis	7
Time Traveller	Willey	*
Tuner	Soft Cottage	*
Whizz Kid	Comp. Tutor	*
Wizard Box	Scisoft	*
Zoo	L'Ensouleiado	6

Language

Forth	Melbourne House	9
Forth	Sinclair	7
48/80 Forth	E London	
Logo	Sinclair	9
Micro Prolog	Sinclair	8
Pascal Compiler	Hi-Soft	*
Snail Logo	CP	8
Spec. Forth	Abersoft	9
Spec. Forth	CP	8
ZX Forth	Artic	8

Practical

Beamscan	Beamscan	9
Computer Cookbook	Bug Byte	5
Cricket Averages	Spartan CC	7
Diet	dk'tronics	*
Diet Master	Diet Master	6
Dietician	Keysoft	4
Engine Diagnostic	Spectrasoft	*
First Aid	Eastmead	4
Football Pools	Hartland	*
How Long have you got?	Eastmead	6
I Ching	Salamander	7
I Ching	Sirius	*
Personal Reminder	SD Micro	*
Spectadraw 2	McAlley	*
Star Gazer	CRL	8
The Complete Guide to Medicine	Eastmead	4
Vega-Table	Vega	7
World Info	Wimsoft	*

Puzzle

Arcturus	Visions	7
Computaword	Work Force	2
Flix	Softricks	7
Hanoi King	Contrast	*
Jumbly	dk'tronics	*
Mazecube	PAL	6
Stuart Henry's Pop Quiz	Bellflower	7
3D Strategy	Quicksilva	8

Simulation

Ashes	Pulsonic	7
Cricket Captain%oAllanson		6
Fighter Pilot	Digital Integration	*
Flight Simulation	Sinclair	6
Full Throttle	Micromega	8
Golf	dk'tronics	*
Howzat	Wyvern	8
Inkos	Chalksoft	*
Match Point	Sinclair	9
New Birkdale	Hornby	8
Olympics	CRL	6
Royal Birkdale	Ocean	8
Strike Attack	Micromart	4
Super Soccer	Winters	4
Test Match	Comp. Rentals	6
The Forest	Phipps	*
The Forest	Phipps	7
Troon	Hornby	8
United	CCS	4
World Cup Football	Artic	7

Strategy

Airline	CCS	7
Angler	Virgin	6
Apocalypse	Red Shift	*
Battle 1917	CCS	8
Battle of Britain	Microgame	*
Brewery	CCS	8
British Lowland	CCS	*
Caribbean Trader	E. Midland	7
Conflict	Martech	*
Conquest	Cheetahsoft	6
Dix Mille	CCS	5
Fall of Rome	ASP	6
Football Manager	Addictive Games	7
Galaxy Conflict	Martech	*
Galaxy Conflict	Martech	8
Gangsters	CCS	8
Gatecrasher	Quicksilva	7
General Election	Bug-Byte	1
Golf	Virgin	7
Great Britain Ltd	Hessel	7
Hunter Killer	Protek	9
It's Only Rock 'n' Roll	K-Tel	5
Johnny Reb	Lothlorien	*
King Arthur	E. Midland	*
Millionaire	Incentive	7
Mugsy	Melbourne House	8
New Venture	Falcon	4
1984	Incentive	7
Oligopoly	CCS	7
Plunder	CCS	8
Red Weed	Lothlorien	7
Reichswald	MW Gamesworld	3
Scatterbrain	Manor	7
Sheepwalk	Virgin	7
Special Operations	Lothorien	8
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Star Trader	Bug-Byte	6
Stonkers	Beau Jolly	9
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Wilfred the Hairy	Microbyte	2

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Arcturus	Visions	7
Backgammon	CP Software	7
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Bridge Master	Serim	7
Bridge Player	CP Software	8
Bullseye	Mastertronic	4
Derby Day	CRL	5
Do Not Pass Go	Work Force	6
Double Dealer	MFM Software	5
Draughts	CP Software	7
Evolution	Microsphere	*
Go To Jail	Automata	*
Grid run/Pontoon	Arcade	*
Mind Games	Oasis	7
Original Superchess	CP Software	*
Pontoon	Contrast	3
Ramopoly	J Fletcher	*
Roulette	Dymond	*
Scrabble	Sinclair	8
Snooker	Visions	*
Super Bridge	Buffer Micro	7
Superchess II	CP Software	8
Superchess III	CP Software	9
The Turk	OCP	8
Voice Chess	Artic	9
Yahtzi	Work Force	*
Yatzee	CP Software	5
ZX Draughts	CP Software	7
ZX Reversi	CP Software	7
ZX-Chess II	Artic	*

Utility

Allsort S-1	A Firminger	7
Assembler	Artic	6
Beyond Basic	Sinclair	5
Building Price	J Redman	6
Cartoon Animation	Fowler	*
Character Generator	ISP	8
Compiler	Softek	6
Composer	Contrast	2
DLAN	Campbell	*
FP Compiler	Softek	9
Games Designer	Quicksilva	7
HURG	Melbourne House	8
Keyword Extension	Timedata	8
Linked Software: Information Handling	McGraw Hill	3
List File	SD Micro	*
Make Music	Buffer Micro	8
Melbourne Draw	Melbourne House	7
Monitor/Diss.	Sinclair	8
Music Maker	Bellflower	3
Paintbox	Print & Plotter	8
Print Utilities	Sinclair	7
Quill	Gilsoft	9
Screen Machine	ISP	7
Softalk 1-2	CP Software	8
Spec. Assembler	Artic	*
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Spectre Mac/Mon	Oasis	8
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Spectrum Extended Basic	CP Software	7
Spectrum Monitor	Picturesque	7
Spectrum Sprites	ISP	8
Spectrum Super Toolkit	Nectarine	8
Supercode II	CP Software	8
The Complete Machine Code Tutor	New Generation	8
Trans Express	Romantic Robot	8
Vu3D	Sinclair	8
Zeus Assembler	Sinclair	9

Software Publishers

A & F Software, Unit 8, Canalside Industrial Estate, Woodbine Street East, Rochdale, Lancashire OL16 5LB
Abacus Software, 21 Union Street, Ramsbottom, Nr Bury, Lancashire
Abbex, 20 Ashley Close, Manor Hall Drive, London NW4
Abersoft, 7 Maesfallen, Bow Street, Aberystwyth, Wales
Add-on Electronics, Units 2,3 & 4, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ
Addictive Games, 7a Richmond Hill, Bournemouth BH2 6HE
ADS, 8 Bronchurch Street, Portsmouth, Hampshire PO4 8RY
Allanson Computing, 77 Chorley Road, Adlington, Chorley, Lancashire PR6 9LH
Alligata Software, 1 Orange Street, Sheffield S1 4DW
APS, 1 Golden Square, London W1
Arcade Software, Technology House, 32 Chislehurst Road, Orpington, Kent BR6 0DG
Arnold Wheaton, Parkside Lane, Dewsbury Road, Leeds LS11 5TD
Artic Computing, Main Street, Brandesburton, Driffield YO25 8RG
Automata UK, 27 Highland Road, Portsmouth, Hampshire P04 9DA
Axis, 71 Brookfield Avenue, Loughborough, Leicestershire LE11 3LN
Beau-Jolly, 19A New Broadway, Ealing, London W5
Bellflower Software, 6 Rosewood Avenue, Greenford, Middlesex UB6 7QP
Betasoft, 92 Oxford Road, Moseley, Birmingham B13 9SQ
Beyond Software, 8 Herbal Hill, London EC1
Bridge Software, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE
Bridgemaster, Sandymouth, Beeches Road, Farnham Common, Buckinghamshire SL2 3PS
Buffer Micro, 310 Streatham High Road, London SW16
Bug-Byte, Mulberry House, Canning Place, Liverpool L1 8JB
Calpac Computer Software, 108 Hermitage Woods Crescent, St Johns, Woking, Surrey
Campbell Systems, 57 Trap's Hill, Loughton, Essex IG10 1TD
CCS, 14 Langton Way, Blackheath, London SE3 7TL
CDS Micro Systems, Silver House, Silver Street, Doncaster, South Yorkshire DN1 1HL
Chalksoft, 37 Willowslea Road, Northwick, Worcester
Cheetahsoft, 24 Ray Street, London EC1R 3DJ
Clever Clogs, Argus Press Software Group, 1 Golden Square, London W1R 3AB
Collins, 18/20 Stephenson Way, North Gower Street, London NW1 2DX
Computatutor, 3 Thalia Close, Greenwich, London SE10 9NA
Contrast Software, Warren Road, Liss, Hampshire GU33 7DD
Cornhill Software, 2 Penrith Way, Aylesbury, Buckinghamshire HP21 7JZ
CP Software, 1 Glebe Road, Uxbridge, Middlesex UB8 2RD
Creative Sparks, Thomson House, 296 Farnborough Road, Farnborough, Hampshire
Cross Software, 36 Langford Crescent, Barnet, Hertfordshire EN4 9EH
Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR3 3RX
Digital Integration, Watchmoor Trade Centre, Watchmoor Road, Camberley, Surrey GU15 3AJ
dk'tronics, Unit 6, Shire Hill Ind Est, Saffron Walden, Essex CB11 3A
Doric Computer Services, 3 The Oasis, Glenfield, Leicester LE3 8QS
Durrell Software, Castle Lodge, Castle Green, Taunton TA1 4AB
Dymond Software, 22 Hospital Road, Annan, Dumfriesshire DG12 5HP
East London Robotics, St Nicholas House, The Mount, Guildford, Surrey GU2 5HN
Eastmead, Eastmead House, Lion Way, Camberley, Surrey GU16 5EZ
Ebury Press, Humphrey Bull & Barker, 62 Dean Street, London W1V 5HG
Elm Computers, 59 Bateman Road, East Leake, Loughborough, Leicestershire LE12 6NN
Fantasy Software, Fauconberg Lodge, 27a St Georges Road, Cheltenham
Fawkes Computing, 41 Wolfridge Ride, Alveston, Bristol BS12 2RA
Felix Software, 19 Leighton Avenue, Pinner HA5 3BW
Fulwood, 20 Templestowe Hill, Whitkirk, Leeds LS15 7EJ
Gargoyle Games, 4 North Western Arcade, Birmingham BS 5LH
Gemini Software, 18a Littleham Road, Exmouth, Devon EX8 2QG
Gemtime Software Division, 16 Ben Ledi Road, Kirkcaldy, Fife KY2 5RP
Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan, South Wales
Gouldstone, 45 Burleigh Avenue, Wallington, Surrey SM6 7UG
Granada Publishing, 8 Grafton Street, London W1X 3LA
Griffin & George, Frederick Street, Birmingham B1 3HT
Harlequin Software, 43 Osprey Park, Thornbury, Bristol BS12 1LY
Hartland Software, 32 Ivor Place, London NW1 6DA
Heath Computing, 7 The Meadows, Flackwell Heath, Buckinghamshire HP10 9LX
Hessel, 15 Lythan Court, Cadwell Crescent, Sunningdale, Berkshire
Hestacrest, PO Box 19, Leighton Buzzard, Bedfordshire LU7 0DG
Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon
Hilderbay, 8/10 Parkway, Regents Park, London NW1 7AA
Hilton Computer Services, 14 Avalon Road, Orpington, Kent
Hisoft, 180 High Street, Dunstable, Bedfordshire LU6 1AT
Homestudy Ltd, Treleigh Woods Farm, Treleigh, Redruth, Cornwall TR16 4AW
Hornby Software, 21 Penfold Hill, Leeds LS15 0PW
Image Systems, 34 Lynwood Drive, Worcester Park, Surrey KT4 7AB
Incentive, 54 London Street, Reading, Berkshire RG1 4SQ
Inform Software, 3 Treesdale Close, Birkdale, Southport PR8 2EL
Interstella Software, 82 New Forest Drive, Brockenhurst, Kent
ISP Marketing Ltd, Crown Hill, 38B High Street, Godalming, Surrey GU7 1DZ
JK Greye Software, 16 Park Street, Bath, Avon BA1 2TE
JRS Software, 19 Wayside Avenue, Worthing, Sussex BN13 3JH
K-Tel International (UK), 60 Western Avenue, London W3 0TU
Kemp, 43 Muswell Hill, London N10 3PN
Keysoft, 6 Bruce Grove, Tottenham, London N17
Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Bedfordshire LU5 6LX
Kuma Computers, 12 Horseshoe Park, Pangbourne, Berkshire RG8 7JW
Legend, PO Box 435, London E4 7LX
Lerm, 10 Brunswick Gardens, Corby, Northamptonshire
Level Nine, 229 Hugenden Road, High Wycombe, Buckinghamshire HP13 5PG
Logic 3, Unit 18, Wye Ind Est, London Road, High Wycombe, Buckinghamshire
Longman, Longman Group, Longman House, Harlow, Essex CM20 2JE
Lothlorien, 56a Park Lane, Poynton, Stockport, Cheshire SK12 1RE
Manor Software, 24 Manor Gardens, London SW20
Martech Games, 9 Billingburgh Road, Eastbourne, East Sussex BN20 8LY
Mastertronic, (as for Mastervision)
Mastervision, Park Lorne, 111 Park Road, London NW8 7SL
McAlley, 1 Cowleaze, Chinnor, Oxfordshire OX9 4TD
McGraw Hill, Shoppen Hangers Road, Maidenhead, Berkshire
Medidata, PO Box 26, London NW9 9BW
Melbourne House, Castle Yard House, Castle Yard, Richmond TW10 6TF
Micro Dealer UK, Unit 6, Marlborough Road Trading Estate, Lattimore Road, St Albans, Hertfordshire
Microbyte, 19 Worcester Close, Lichfield, Staffordshire
Microcosm, 68 The Glade, Clayhall, Ilford
Micromania, 14 Lower Hill Road, Epsom, Surrey KT19 8LT
Micromega, 230/236 Lavender Hill, London SW11
Microsphere, 72 Roseberry Road, London N10 2LA
Mikro-Gen, 44 The Broadway, Bracknell, Berkshire RG12 1AG
Minatron Computing, 34 Pinewood Close, Westbury on Trym, Bristol BS9 4AJ
Mirrorsoft, PO Box 50, Bromley, Kent BR2 9TT
Monitor Software, PO Box 442, London NW7 2JF
Mosaic, 187 Upper Street, London N1 1RQ
MW Gamesworld, 12 Lawnswood Avenue, Chasetown, Walsall WS7 8YD
Myrmidon Software, PO Box 2, Tadworth, Surrey KT20 7LU
Naigram Software, c/o Soho Synth House, 18A Soho Square, London W1V 5FB
Nectarine, 837 Yeovil Road, Slough SL1 4JH
Newsoft, 12 White Broom Road, Hemel Hempstead, Hertfordshire
NTD Software, 19 Radipole Road, London SW6
Oasis Software, 9a Alexandra Parade, Weston-Super-Mare, Avon BS23 1QT
Ocean Software, 6 Central Street, Manchester M2 5NS
OCP, 4A High Street, Chalfont St Peter, Buckinghamshire SL9 9QB
Orwin Software, 26 Brownlow Road, Willesden, London NW10 9QL
Penguin, 536 King's Road, London SW10
Phipps Associates, 172 Kingston Road, Ewell, Surrey

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Phoenix Publishing, 14 Vernon Road, Bushey, Hertfordshire WD2 2JL
Picturesque, 6 Corkscrew Hill, West Wickham, Kent BR4 9BB
Poppysoft, The Close, Common Road, Headley, Newbury, Berkshire
Print 'n' Plotter Products, 19 Borough High Street, London SE1 9SE
Protek Computing, 1a Young Square, Brucefield Ind Park, Livingston, West Lothian
PSS, 452 Stoney Stanton Road, Coventry CV6 JDG
Pulsonic, Warwick Distribution Ltd, 3 Standard Road, Park Royal, London NW10 6EX
Quicksilva, Palmerstone Park House, Southampton, Hampshire S01 1LL
R and R, 34 Burton Road, Gloucester GL4 0LE
RAM Writer, 3 Vumba House, 2 Cedar Gardens, Sutton, Surrey
Ramtop Services, 5 Rue D'Artois, 75008, Paris, France
Red Shift, 12c Manor Road, Stoke Newington, London N16 5SA
Romantic Robot, 113 Melrose Avenue, London NW2 4LX
Romik Software, 272 Argyll Avenue, Slough SL1 4HE
Rose Software, 148 Widney Lane, Solihull, West Midlands
Runesoft, Charnwood House, Crossgate Drive, Nottingham NG2 TLW
Salamander Software, 27 Ditchling Rise, Brighton, East Sussex BN1 4QL
Scisoft, 5 Minster Gardens, Newthorpe, Eastwood, Nottingham NG16 2AT
SCR Adventures, 190 Shelbourne Road, Tottenham, London
SD Microsystems, 9 Cadwell Court, Hitchin, Hertfordshire SG4 0AQ
Selec Software, 37 Councillor Lane, Cheadle, Cheshire
Serim Software, Freepost, Dept SU7, PO Box 163, Slough, Berkshire SL2 3YY
Shards, Suite G, Roycraft House, 15 Linton Road, Barking, Essex
Shepherd Software, Elm House, 23-25 Elmshott Lane, Chippenham, Slough, Berkshire
Silversoft, London House, 271/273 King Street, London W6 9LZ
Sinclair Research, 6 Kings Parade, Cambridge
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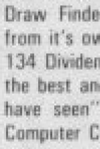
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